Ryszard Witkowski

ROTORCRAFT of the Third Reich

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On the title page:
Fa 223 Drache during factory test flight, still without any markings.
[M. Krzyżan Archive]

Prelude

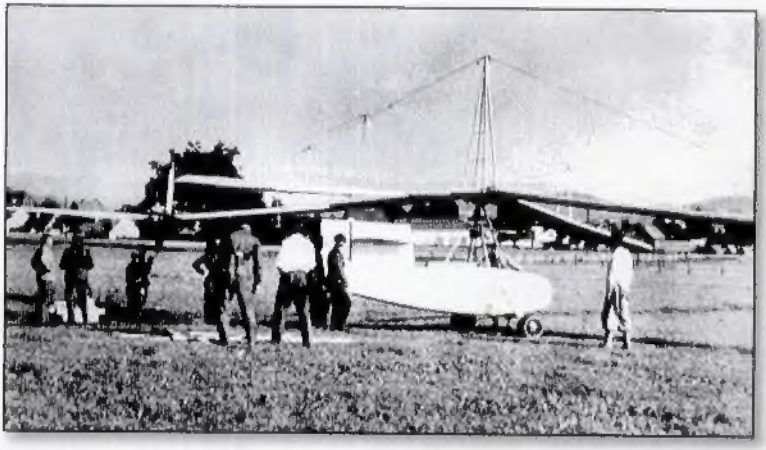
At the start of WW2 in September 1939, no air arm in the world could boast a single helicopter, although in some countries autogyros were used by the military. Small numbers of these were used by the air forces of the Soviet Union, Britain, France and the USA. However, it was Germany that was closest to the introduction of genuine helicopters into service, as mature helicopter designs were undergoing flying testing in that country. It was easy to foresee that operational machines would soon follow.

German development work on rotary wing aircraft go back to the 19th century. Among others, Fritz and Wilhelm von Achenbach from Weidenau am Sieg put forward their project in 1874. Their design included all the components found in today's helicopters, such as the fuselage-mounted power plant (steam engine with boiler in their case), four-blade lifting rotor, and ducted six-blade tail rotor. Not long afterwards, in 1886, Oskar Möcke announced his idea of an 'aerial velocipede' *(Luft-Velociped)* fitted with one, two or four 'screws' driven by compressed air blowing from the blade tips. In 1904 Carl Zenker at Bremen undertook to build a rotary wing VTOL aircraft called appropriately 'Bremen 1', while about the same time *Oberpostschaffner* (senior post official) Josef Strobel in Munich constructed a manually powered rotorcraft, and apparently he even attempted trial take-offs. During 1908/1909 the designers Krell and Boucart (from the Siemens-Schuckert company) and Lippe (from Rumpler) built experimental helicopters in Berlin. In 1912 Otto Baumgärtl, an engineer from Dresden, designed and built an experimental helicopter with co-axial rotors.

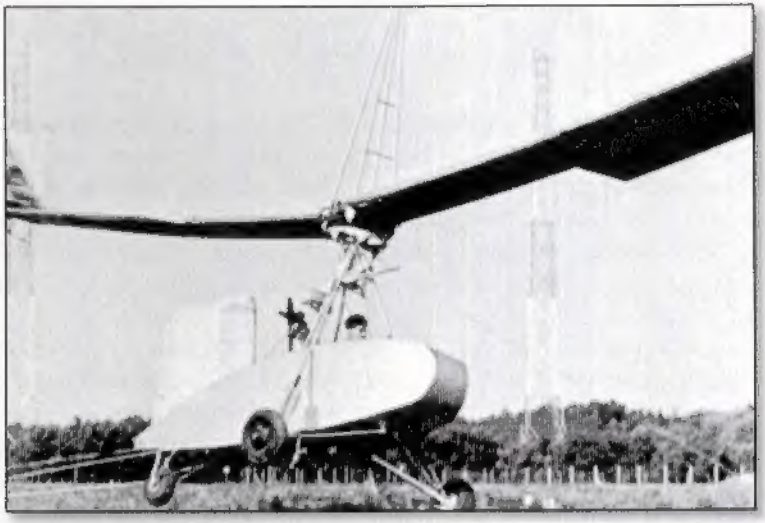
Flettner

German development work on rotorcraft was revived in the early 1930s, courtesy of two outstanding designers: Anton Flettner and Henrich Focke.

The aerodynamicist Anton Flettner was born on 1 November 1885, at Eddersheim near Frankfurt am Main. He was interested in aviation from 1905, but initially he was just an observer of the emerging technology. He later gained fame as an inventor. In 1914 he patented a new method of steering a torpedo, and then developed the concept of aircraft control surface balance tabs. During the



Gigant experimental helicopter at the airfield in Hirschberg (now Jelenia Góra in Poland), 1934.
[R. Witkowski Archive]



The Gigant experimental helicopter hovering above the airfield in Hirschberg (now Jelenia Góra in Poland), 1934.
[R. Witkowski Archive]

Crash of the Gigant experimental helicopter on the airfield in Hirschberg (now Jelenia Góra in Poland), 1934.
[R. Witkowski Archive]

Fw C.30A autogyro built in Germany under licence, 1934.
[M. Krzyżan Archive]

1920s he became known as a designer and constructor of the rotating cylinder ('Flettner rotor'), replacing sail for propulsion of ships. The device, using the so-called Magnus effect, was tested on the ship *Buchau*, launched by Germania Werft shipyards in Kiel, which used this unorthodox power plant to cross the Atlantic in 1924. Another ship powered by the rotating cylinder, called *Barbara*, was launched in 1926 and operated until 1932.

Flettner built his first rotary wing aircraft in 1932. He designed a single-seat helicopter with direct rotor drive, following earlier work by Vittorio Isacco. The helicopter was built by the Segelflugzeugbau Edmund Schneider company at Grunau near Hirschberg (now Jeżów Sudecki near Jelenia Góra in Poland). Pompously called *Gigant* (Giant), it had a 30.5 m (100 ft) diameter two-blade rotor, powered by two 22 kW (30 hp*) Anzani engines fitted in the middle of the blades, and driving small propellers. The blades were attached by hinges in the rotor head, and a flap hinge on each blade was located in the middle of its span. The blades were wooden, plywood covered. When static, on the ground, the blades were prevented from touching the ground by cables that connected the blade tips and engine mounts with a pylon above the rotor head. The rotor was controlled by ailerons at the blade trailing edges, and control around the vertical axis was maintained using a small rudder on the fuselage. During 1933-1934 the *Gigant* made about a dozen successful tethered flights at Hirschberg, but it was destroyed during a free hover trial at 6 m (20 ft), being turned over by strong winds.

**Note, that all engine power data are stated in continental (metric) hp. 1 BHP= 1.0114 (metric) hp*

At the time when Flettner was experimenting with the *Gigant*, the LC II, I Department of the *Reichsluftfahrtministerium* (RLM, Reich Air Ministry), held a meeting in December 1934 called by Erhard Milch, during which it was decided to include rotorcraft, as *Sonderflugzeuge* (special aircraft), in the overall German aircraft industry research and development programme. The decision, crucial for the development of helicopters, was discussed in paragraph four of the minutes from the meeting in the following words:
"...Development of rotorcraft should be given priority. Accordingly, the work already started should be accelerated, as most probably this kind of aircraft will have great importance in the future, in land- and sea-based applications..."

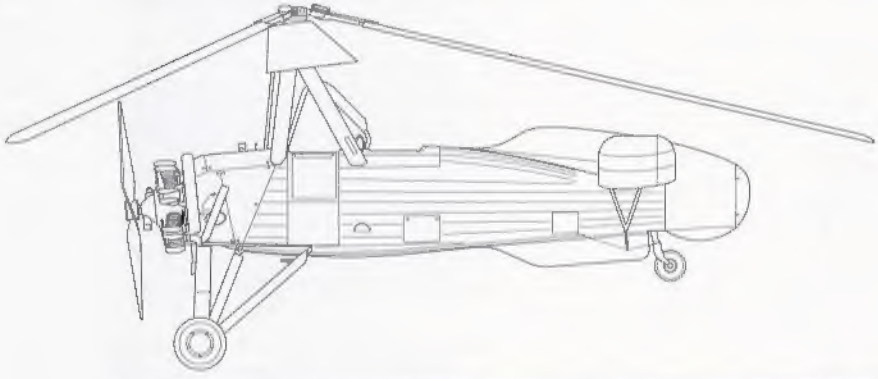
Fw C.30A autogyro built in Germany under licence, 1934
[M. Krzyżan Archive]

Let's remember - this far-sighted German forecast was made in 1934, when rotorcraft technology was still in its infancy worldwide!

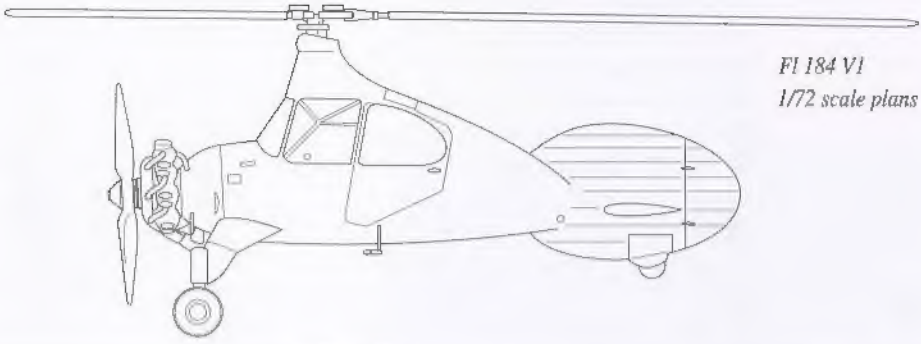
The *Kriegsmarine*, the Third Reich's navy, was the first service to start work on the new technology, following the RLM suggestions. The navy was interested in developing a rotorcraft able to operate from warships, in place of observation floatplanes based on heavy ships. Interest was focused on the C.30A *Heuschrecke* autogyro, recently introduced into licence production by Focke-Wulf GmbH. First trials of the autogyro from ships commenced on 10 November 1936, at the naval experimental centre (*E-Stelle*) at Travemünde on the Baltic coast. The trials were a failure, as the autogyro encountered major problems landing on the relatively small deck platform, especially in gusty winds. As these problems were thought to be linked with specific features of the C.30A autogyro it was decided to stop the trials, and undertake further experiments with an autogyro of indigenous German design, developed at the time by Anton Flettner, which gave better performance than the British pattern.

The sole prototype Fl 184 V1, D-EDVE, first flown in November 1936, was powered by a 160 hp (118 kW) Siemens-Bramo Sh 314A air-cooled radial. It was not a 'pure' autogyro, as in forward flight a proportion of the engine power could drive the 12-metre rotor, although its main role was to drive the two-blade tractor propeller. The machine was short-lived, and in December the prototype was destroyed in an accident which was never fully understood as the pilot was killed. During a steep turn into the wind at 100 m, the machine

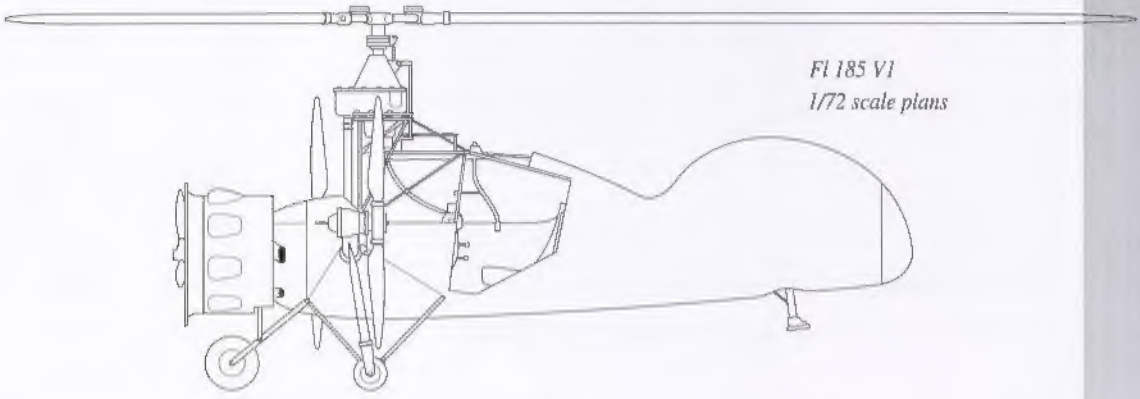
Fw C.30A autogyro. 1/72 scale plan



Fw C.30A autogyro built in Germany under licence, 1934. [M. Krzyżan Archive]



Fl 184 V1
1/72 scale plans



Fl 185 V1
1/72 scale plans

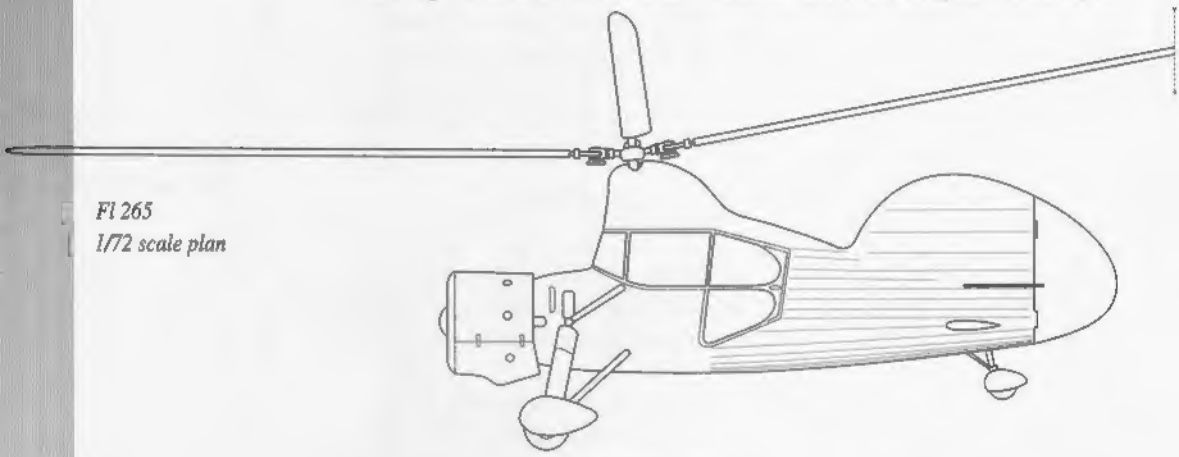
suddenly entered a dive and crashed. As the prototype was destroyed, shipboard trials were never carried out. Because this coincided with the negative results of testing the C.30A on ships, the Kriegsmarine eventually abandoned its autogyro plans and focused on helicopters.

The contract to build the first helicopter for the navy was awarded to Flettner. The machine, with civil registration D-EFLY, was designated the Fl 185 V1 *Heligyro*. It was a single-seat helicopter with three-blade main rotor and an

The Fl 184 experimental hybrid rotorcraft.
[R. Witkowski Archive]

unusual method of balancing the torque: each side of the fuselage was fitted with a tubular pylon, with a propeller at its tip, the starboard one providing thrust backwards, and the port forwards. The propellers were driven by a flexible shaft. The helicopter was powered by a 160 hp (118 kW) Siemens-Bramo Sh 314A radial, similar to that of the Fl 184, located in the forward fuselage; the main gearbox was also located there. The designer, (now assisted by two young scientists, Dr Gerhard Sissingh and Dr Kurt Hohenemser from Göttingen), assumed that the Fl 185 would be able to fly with rotor autorotation, as an autogyro. In such condition both propellers would provide forward thrust, driven by the full power of the engine. In 1938 the helicopter, flown by Emil Arnolt, made a series of successful test flights, attaining a forward speed of 65 km/h, but no shipboard trials were carried out. This was because the navy approved Flettner's proposal to change the shipboard helicopter design, and ordered the new machine as the Fl 265.

The new intermeshing rotor layout, used in the Fl 265, was a compromise between the lateral twin rotor arrangement as tested in the Fw 61 experimental helicopter, and the co-axial solution used in the French Bréguet-Dorand *Gyroplane-Laboratoire*. In the Flettner design two two-bladed rotors were located in such a way that their axes were located as close to each other as possible, while being angled. As a result, the planes of rotation of the rotors intersected, forming a flat 'X' when seen head-on. In fact this was not a new idea, as the patent for this design was claimed in 1902 by Max Boucart, and in the 1930s it was studied theoretically by Dr Edward Bennett from the Cierva Company in Britain, although his work did not lead to a practical application.



Fl 265
1/72 scale plan

An order for six prototype machines was placed by the Kriegsmarine in 1938, and completed, in utmost secrecy, by the Flettner plant at Berlin-Schönefeld aerodrome. It was there, in a remote hall, that tethered trials of the first prototype (Fl 265 V1 D-EFLV) were carried out, the machine lifting up to 0.2 m. The first free flight of the first of six prototypes (constr. nos. 1579-1584) was made by the test pilot Flugkapitän Richard Perlia on 16 May 1939. The same month Perlia displayed the capabilities of the machine, which included towing dinghies and picking up dummies from the dinghies. On 3 July 1939 the helicopter was shown to Adolf Hitler and the Luftwaffe HQ (including Hermann Göring, Ernst

Display of the Fl 265 prototype at Berlin-Schönefeld in May 1939. [M. Krzyżan Archive]

The broad undercarriage and engine cooling fan are clearly shown in this head on view of the Fl 265.
[R. Perlia via M. Krzyżan Archive]

Udet, Roluf Lucht) at Rechlin-an-der-Müritz in Neubrandenburg, some 100 km north-west of Berlin. During the display the helicopter, flown by Richard Perlia, hovered for 5 minutes above the officials, which earned the pilot 1,000 Reichsmarks from Anton Flettner.

Focke

Dr Henrich Karl Johann Focke started his rotorcraft work in 1931, when the Focke-Wulf company purchased licence rights for the British Cierva autogyros. These were manufactured as the Fw C.19A, Fw C.19B and Fw C.30A. One Fw C.19A autogyro, named *Don Quichote** (registered D-2300) took part in the 1933 flight around Germany (Deutschlandflug 1933). Thirty of the Fw C.30A autogyros were built, powered by 140 hp (103 kW) Siemens Sh 14B-2R engines, and called *Heuschrecke*. The autogyro activity of the company was concluded in 1938, when Dipl. Ing. Kosel designed the Fw 186, using the fuselage of the Fw 56 Stößer trainer aeroplane. Two prototypes, the V1 (registered D-ISTQ) and the V2 (D-IXNN), participated in the competition for a Luftwaffe liaison aircraft, which was won by the Fi 156 *Storch* STOL aeroplane.

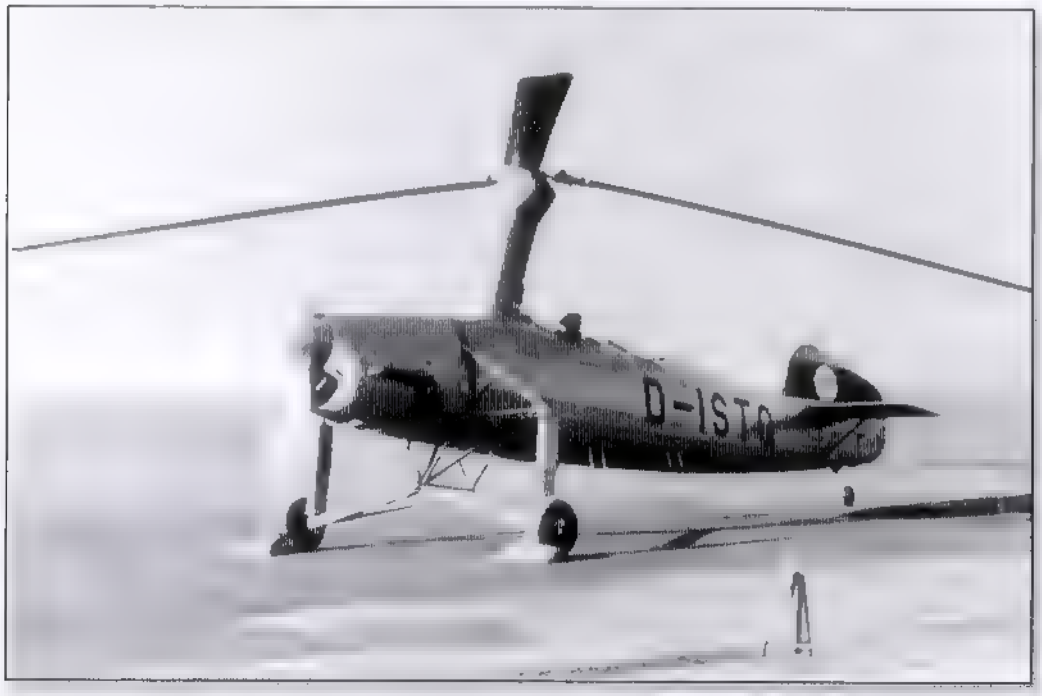
**Named after the fictitious Spanish nobleman, Don Quixote who tilted at windmills, this was particularly appropriate for a Spanish designed aircraft that looked like a windmill*

The famous German WW1 ace, later a General of the Luftwaffe, Ernst Udet was a great enthusiast for the autogyros. Impressed by the new type of aircraft, in 1928 he published a series of newspaper cartoons featuring these machines with witty rhymed comments.

Two views of the Fw C.19A autogyro built in Germany under licence, 1933.
[M. Krzyżan Archive]

Display of the Fl 265 prototype at Berlin-Schonefeld in May 1939. [R. Pertia via Krzyżan Aviation Archive]

Fw 186 autogyro designed by Dipl. Ing. Kosel in 1938. [M. Krzyżan Archive]



Cartoons and epigrams on autogyros authored by the famous pilot, Ernst Udet {Hubschrauber-zentrum Buckeburg}

Autogyro
It climbs and sinks vertically
Thanks to the rotor above
Lands, when so ordered
Even on the surface of a soup plate!

Designer's error
My God! will complain the inventor
Who tried to show his spinning top
Turning is all what you wish
But the rotor stands still!!

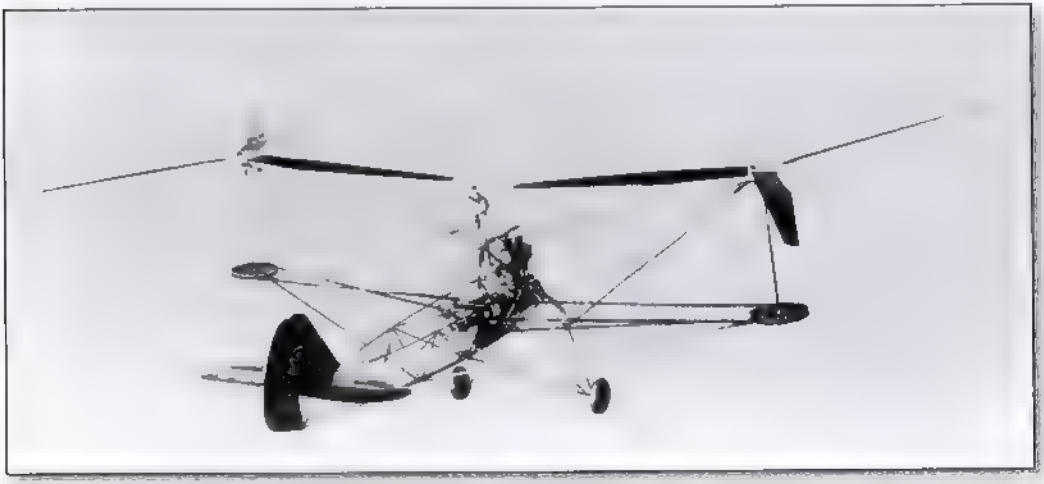
Der Auto = Biro.
Er ſteigt und ſenkt ſich vertikal,
Und oben kreiſet ſein Propeller.
Er landet, wenn man dies befahl –
Genau ſelbſt auf 'nem Suppenteller!

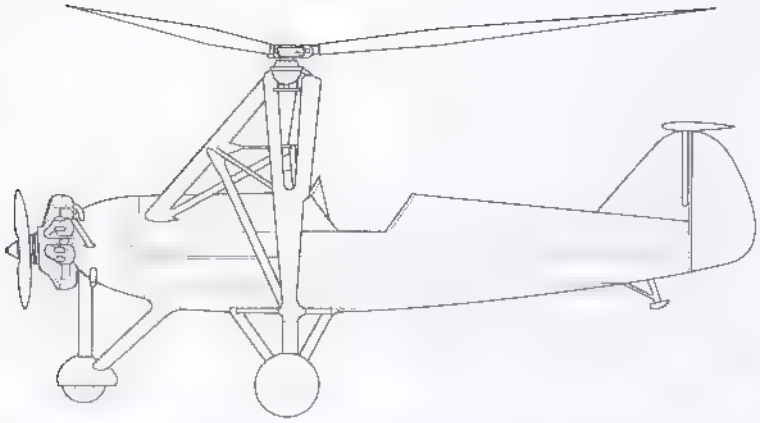
Der Konſtruktionsfehler.
Mein Gott, wird der Erfinder ſchmollen,
Der ſeinen „Kreiſler" zeigen will:
Es dreht ſich alles, was ſie wollen –
Nur der - Propeller, der ſteht ſtill!!!

In 1934 Focke built a small helicopter model, weighing just 4.9 kg and powered by a miniature 0.7 hp (0.5 kW) 2-cylinder two stroke engine. The helicopter had a lateral twin rotor configuration. The model flew so well (reaching 18 m in one flight) that it encouraged the designer to build a full-scale one, and this was developed in co-operation with the well-known aerobatic pilot, Gerd Achgelis. The experimental machine was built by Focke-Achgelis & Co GmbH, established in 1937.

The central body of the helicopter, designated Fw 61, was based on a modified fuselage of the Fw 44D *Stieglitz* trainer aeroplane. It featured two tubular spacetrame side pylons supporting lifting rotors, and tricycle undercarriage with an auxiliary tail wheel. The original engine of the aeroplane, a 7-cylinder 160 hp (118 kW) Siemens Sh 14A radial, was modified, by providing an extension of the drive shaft at the rear of the crankcase, and fitting it with a split gear

Henrich Focke's twin-rotor helicopter model of 1934 {R. Witkowski Archive}





Fw 61
1/72 scale plan

The Fw 61 V1 D-EBVU helicopter taxiing for take-off. Henrich Focke is second from left
[R. Witkowski Archive]

The Fw 61 V1 D-EBVU helicopter in low hover
[R. Witkowski Archive]

Fw 61 V2 D-EKRA in flight
[Stratus collection]

Fw 61 V2 D-EKRA in flight
[R. Witkowski Archive]

Following the display of the Fw 61 helicopter, the test pilot Hanna Reitsch talks to representatives of the Reichsluftfahrtministerium (Reich Air Ministry), Ernst Udet and Roluf Lucht
[R. Witkowski Archive]

Fw 61 V2 in flight

(M. Krzyzan Archive)

The Fw 61 experimental helicopter during tests at Bremen, 1936.

(M. Krzyzan Archive)

The Fw 61 helicopter during factory tests at Bremen, flown by the test pilot Ewald Rohlfs [R. Witkowski Archive]

to drive the rotors. The original shaft at the front was fitted with a cropped, half-diameter propeller, acting as an engine cooling fan. The main drive shaft featured a coupling, and the individual rotor shafts were fitted with Cardan joints (universal joints).

Each of the main rotors of the Fw 61 was 6 m in diameter and had three lozenge shaped blades. The blades were mounted in rotor heads on flap hinges. In principle the blade design was similar to that of Cierva autogyros. The rotor heads included collective pitch control mechanisms, with automatic devices to switch the blades to autorotation angles in case of power-plant failure, and semi-swash plates to tilt the rotor discs in the longitudinal plane (allowing the helicopter to turn while in hover).

Flight controls of the Fw 61 included: control stick, pedals and engine throttle (rotor rev) lever. Lateral moves of the stick caused differential lift changes on both rotors, allowing lateral control of the helicopter. Longitudinal stick moves caused identical tilting of both rotor discs. Operating the pedals tilted

The Fw 61 experimental helicopter in hovering flight, flown by Hanna Reitsch. [R. Witkowski Archive]

each rotor disc in opposite directions. The amount of lift generated by the rotors was dictated by their revs

The Fw 61 made its first flights in the open on 26 June 1936 (the test pilot, Dipl Ing Ewald Rohlfs, learned to fly it during tethered flights, made from late 1935 inside an old factory building) Initially, the tethered Fw 61 rose to 1 m above ground, and then it made its first free flight at the factory airfield in Bremen. This lasted a mere 28 seconds, but the fourth flight was 16 minutes long During its first take-offs the helicopter was stripped right down, even to the point where the fuselage had no fabric covering Progress in the trials was very rapid. On 10 May 1937 Rohlfs first entered the Fw 61 into autorotation and landed with the engine out.

There is no doubt that the Fw 61 was the most successful experimental helicopter of al, those built between the wars, and this was proved by the records it established, as recorded by the FAI. The first five were established by Ewald Rohlfs:

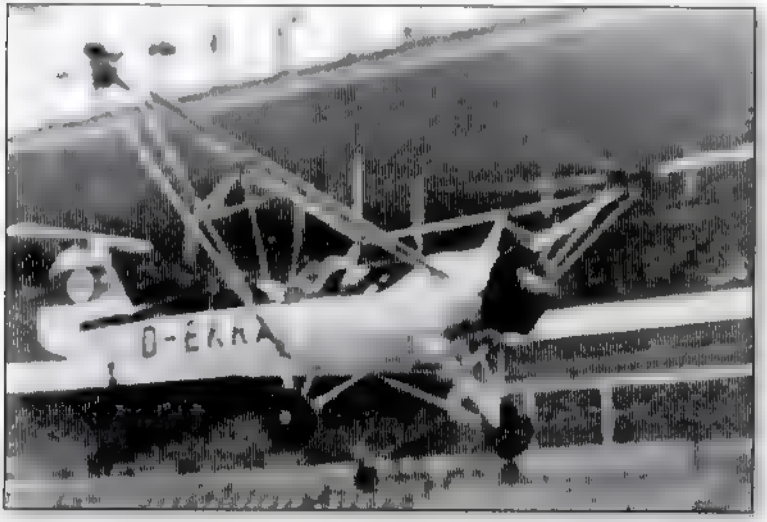
- on 25 June 1937 - helicopter flight endurance 1 h 20 min 49 s (previous record of 1 h 2 min 50 s belonged to the French Breguet-Dorand *Gyroplane-Laboratoire* helicopter flown by Maurice Claisse) and helicopter flight altitude 2,439 m (previously 158 m, the helicopter and pilot as above),
- on 26 June 1937 - helicopter flight speed over a base of 20 km: 122.553 km/h (previously 99 962 km/h, the helicopter and pilot as above), distance in closed circuit 80 604 km and straight line distance of 16 4 km (previous record of 1 078 km belonged to the Italian helicopter d'Ascanio and to pilot Nello Marinelli)

Another record was established in the Fw 61 by female test pilot Hanna Reitsch·

- on 25 October 1937 she broke the record of Ewald Rohlfs in straight line distance (Berlin-Stendal) achieving 108.974 km.

The third test pilot to fly the Fw 61, Karl Bode, established two records

- on 20 June 1938 he bettered the record of Reitsch in straight line distance, achieving 230.248 km, and



February 1938. The first flight trial of the Fw 61 V2 D-EKRA inside the Deutschlandhalle The machine was flown by Karl Bode
[R. Wukowski Archive]

- on 29 January 1939 he broke the altitude record of Rohlfs, taking the Fw 61 to 3,427 m.

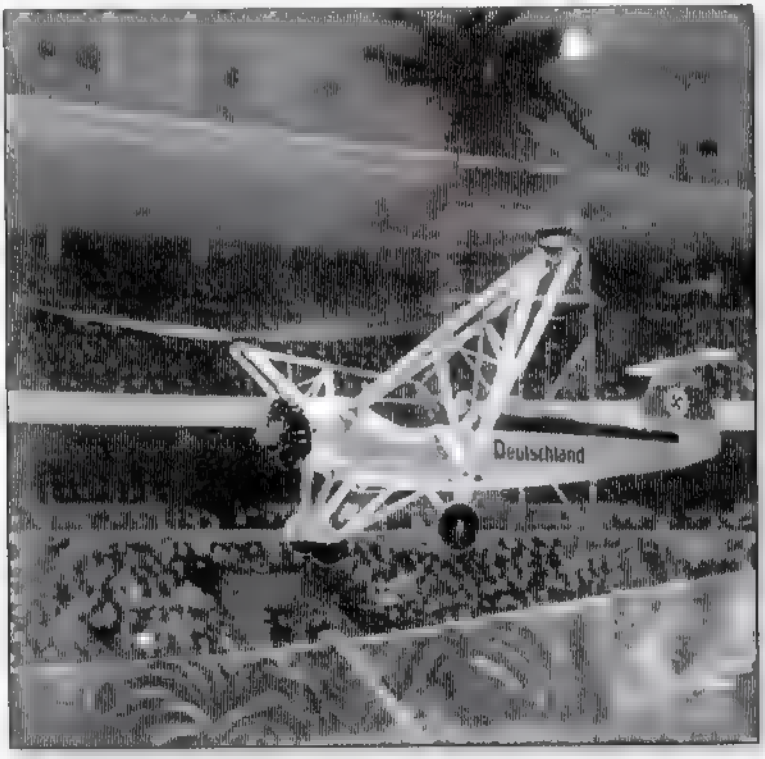
For pure propaganda reasons, in February 1938 Hanna Reitsch flew the Fw 61 in the world's first public indoor flying display of a helicopter (in the Deutschlandhalle in Berlin), as part of exotic variety shows about the colonies lost by Germany in Africa. It is less known that originally the display was to be flown by Karl Bode. During one of rehearsals (fortunately without the public present) an accident took place when a Cardan joint (universal joint) broke in one of the rotor drive systems. The Fw 61 was seriously damaged, and Bode was temporarily suspended. Reitsch then flew the other Fw 61, hurriedly brought from Bremen*

There were two Fw 61s, D-EBVU (V1) and D-EKRA (V2). The former was flown for a while with a spat on the nose wheel and streamlined fairings on the main tubes of the side pylons. Both these helicopters were destroyed in Allied bombing of Berlin. After the war a replica of the Fw 61 D-EKRA was built in West Germany, and this is now displayed at the Hubschraubermuseum (helicopter museum) at Buckeburg in Lower Saxony.

**There is a story about a 'lack of oxygen' affecting the pilot (Bode's performance' requiring the windows to be opened in later flights. This was stated by Hanna Reitsch and repeated many times subsequently. Hanna Reitsch, although a very talented pilot, did not have a technical background and didn't understand many of the technical aspects. The consumption of oxygen by the pilot in the cold would have been much greater than the requirements of the helicopter's engine, and that was probably the reason for opening windows.*

Rieseler

Some interesting work on helicopters was also carried out in Germany in the 1930s by a re-emigrant from the USA, Walter Rieseler, who returned to his homeland in 1934. Prior to that he had worked with the famous American aircraft scientist Dr Alexander Klemin and was engaged in autogyro research. Soon afterwards he claimed a patent for the co-axial rotor helicopter. He started



The Fw 61 helicopter flown by Hanna Reitsch inside the Deutschlandhalle during the colonial variety shows in Berlin in 1938.
[H. Schaller via M. Krzyzan Archive]

February 1938. The accident of the Fw 61 V2 D-EKRA in the Deutschlandhalle. The machine was flown by Karl Bode [R. Witkowski Archive]

its construction at Berlin-Johannisthal. The machine featured an open space-frame fuselage, with a 60 hp (44 kW) engine and pilot's seat located inside. The fuselage was supported by a four wheel undercarriage. Pedal actuated control surfaces were located at the front and rear. The control stick was used to tilt the discs of both contra-rotating rotors. First flight in the prototype, designated R-I, was made by Rieseler in 1936. The helicopter had good manoeuvrability, in level flight it attained speeds up to 160 km/h. However, the engine was not powerful enough, and it overheated in flight, and as a result the R-I prototype was heavily damaged in an accident after a few flights. The designer, undaunted, built a new, improved, two-seat version, the R-II, with two 150 hp (110 kW) Siemens engines, flown in 1937. Higher power and increased diameter of the rotors resulted in markedly improved performance of the helicopter, with flights lasting up to 20 minutes, and the maximum altitude was 60 m. Unfortunately, this helicopter was heavily damaged too, when the test pilot made a violent dive recovery immediately above the ground. Construction of a third version of the helicopter was terminated in 1938 by the sudden death of the designer.

Hanna Reitsch's flight inside the Deutschlandhalle in Berlin in 1938 (general rehearsal without public). The Fw 61 here was the first prototype, its registration D-EBVU replaced for propaganda reasons with the word Deutschland (Germany) [H. Schaller via M. Krzyzan Archive]

February 1938. Press pass into the Deutschlandhalle with permit to take photos, for the colonial variety shows, during which the Fw 61 helicopter flights were the main attraction.
[M. Krzyżan Archive]

Bildberichterstatterausweis

berechtigt zum Eintritt in die Deutschlandhalle zwecks Vornahme von fotographischen Aufnahmen anläßlich der Revue „Ki sua heli - mit 300 Stdkm. durch die Tropen"

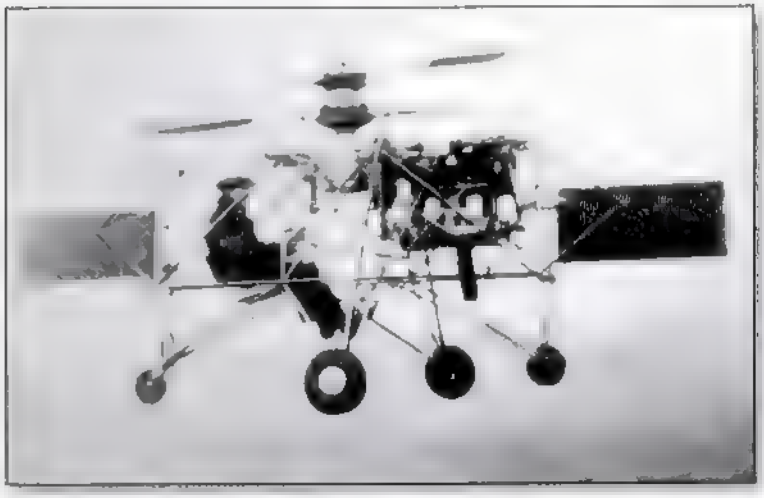
am 19. Februar 1938

Nur gültig in Verbindung mit der amtlichen Armbinde.
Das Betreten des Innenraums ist nicht gestattet.

Deutschlandhalle Aktiengesellschaft BERLIN

DEUTSCHLANDHALLE
AKTIENGESELLSCHAFT

At the same time, in the early 1930s, the German electromechanical concern AEG (*Allgemeine Elektrizität Gesellschaft* - German Electrical Company) undertook the development of a tethered observation helicopter. It was designed by Ing. R. Schmidt and built at the plant in 1933. The electric helicopter was built with support from the Heeres-Waffenamt (army weapon bureau), interested in replacing its obsolete tethered balloons with modern equipment. Although the design reached the stage of test flights, the designer failed to solve the question of stability of the pilotless device, and in 1936 further work was abandoned. Slightly later AEG revived the idea of a tethered observation helicopter, this time the project of another designer, Prof. Dr Kirchberg. With a different position of the machine's centre of gravity and different system of tethering cables, the helicopter attained a degree of stability that gave hopes of success. The prototype of a production version was subjected to long (200 h) operational tests on the ground, to identify its reliability and fatigue resistance of mechanisms and the structure, and was tested for many hours in flights up to 750 m. Eventually, however, the tethered observation helicopter never entered production.

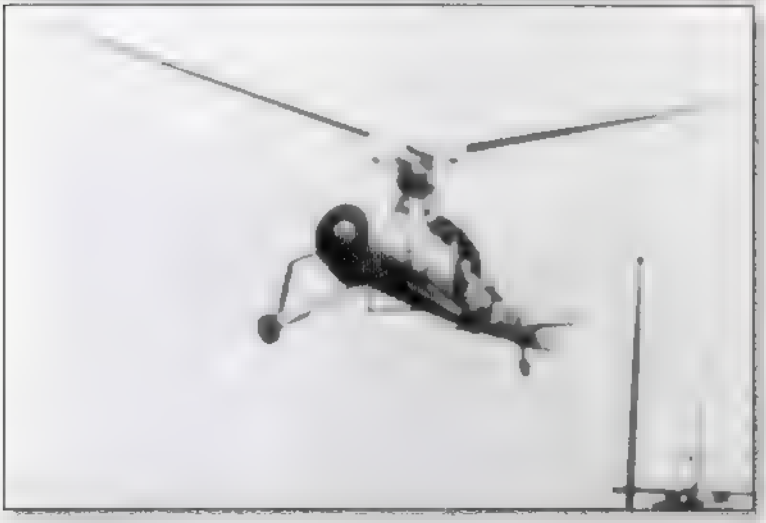


The R II experimental helicopter of Walter Rieseler, from 1937
[R. Witkowski Archive]

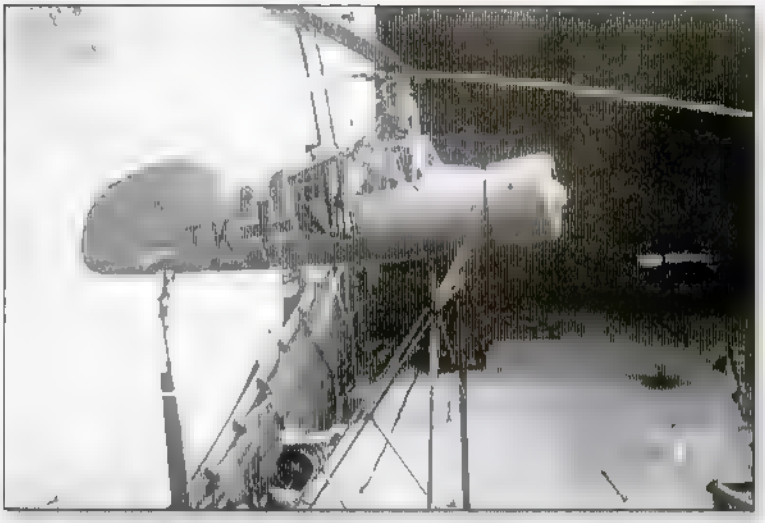
Kolibri (Hummingbird)

The Fl 265 mentioned in the previous chapter was a single seat helicopter weighing 800 kg and able to lift a 200 kg load. It was powered by a 160 hp (118 kW) Siemens-Bramo Sh 314A air cooled radial engine located, as in the Fl 185, in the nose of the fuselage under a cylindrical fairing. The engine was cooled by a fan, initially with three, and then with six blades. It had an aeroplane-type undercarriage with tail wheel. The helicopter was able to attain speeds of up to 160 km/h, but it had one major shortcoming: absence of coupling in the power system and the manual collective pitch control, which is common today (the change of thrust of the rotors depended solely on the revs), which meant that it could not enter autorotation. This major fault was only cured in the second prototype, the Fl 265 V2 (with radio code TK+AN). After trials carried out in

Fl 265 during winter operational tests, 1939/1940.
[R. Witkowski Archive]



Take-off and landing tests of the Fl 265 helicopter on a 5 x 5 m platform fitted on a gun turret of the cruiser Köln (summer 1939).
[M. Krzyzan Archive]



Fl 265 TK+AN in the large wind tunnel at Chalais-Meudon in France, 1940
[R. Witkowski Archive]

the summer of 1940 in the great wind-tunnel at Chalais-Meudon in occupied France. Flettner also introduced, apart from the idle gear coupling, a system for automatic switching of the rotor blades to autorotation angles after power-plant failure. The first unpowered autorotation landing of the Fl 265 V2 was made by Richard Perlia in August 1940.

In the summer of 1939 operational tests of the Fl 265 V1 on warships were started. These included landings on a 5x5 m platform fitted on a gun turret of the cruiser *Köln*, as well as on a U-boat. These tests were carried out on the Baltic Sea, but they did not proceed without problems. On 21 August 1939, as a result of excessively rough piloting at low altitude, the Fl 265 V3 prototype was destroyed in accident. The young test pilot, Hans Bay, was killed. A fatal accident of the V1 followed. This time the crash was due to a main gearbox lubrication fault, resulting in overheating of the gear which was then unable to transmit the full power to the rotors, resulting in a drop in revs. The pilot should have landed immediately in a field, (as he was flying a machine that was unable

Take-off and landing tests of the Fl 265 helicopter on a 5 x 5 m platform fitted on a gun turret of the cruiser Köln (summer 1939).
[M. Krzyzan Archive]

to make an autorotation landing) While he was still at 30 m (100 ft) the revs dropped so much that the blades "folded up", and the machine crashed

Shipboard tests of the Fl 265 continued with the V2 TK+AN, fitted with the system for automatic switching of rotor angles to autorotation settings after power-plant failure. Later on the Fl 265 V2 participated, together with four other machines of the prototype batch, in operational naval trials on a *Königsberg*-class light cruiser.

Other tests were undertaken for the army These included transport of bridge components and delivery of supplies Flights were made in good and bad weather, in low terrain and in the mountains Trials were also conducted to assess the survivability of the helicopter when attacked by an aeroplane. Much to the surprise of the observers, after 20 minutes of simulated attacks by a Bf 109 against a manoeuvring Fl 265, the fighter's camera gun showed no hits! Admiration was also caused by the efficiency of transporting a 225 kg mountain gun slung under the helicopter. During the operational tests all six

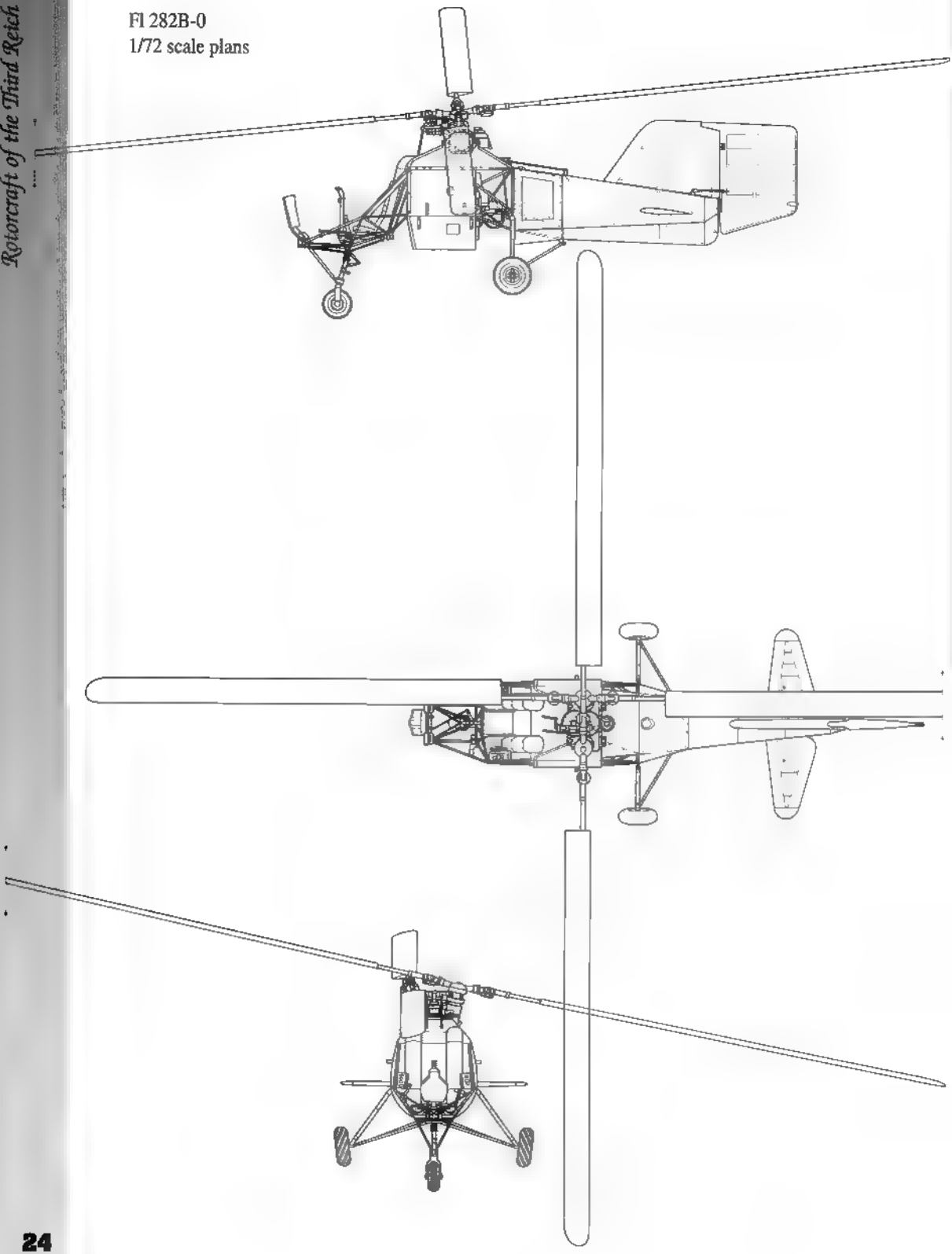
Fl 265 TK+AN in the large wind-tunnel at Chalais-Meudon in France, 1940 [R Witkowski Archive]

Fl 265 machines of the V batch flew a total of 126 hours 32 minutes, making 1,180 take-offs and landings

During 1940 production of the Fl 265 was prepared in the Arado plant at Johannistal near Berlin, but the work soon stopped This was due to an important shift in the concept of the army and navy helicopter, offered suddenly by Anton Flettner The main point was to relocate the power plant of the helicopter from its original 'aeroplane' position in the nose to the centre of the fuselage This gave the pilot better environment and allowed a two-seat version of the helicopter to be built.

The Fl 282, which replaced the Fl 265 in production, and which was given the name of *Kolibri* (Hummingbird), featured the same system of two 2 blade intermeshing rotors with intersecting discs The axes of the rotors were inclined by 24° to each other, and by 6° forward. The diameter of each rotor was 11.97 m The fuselage of the helicopter was 6 16 m long and 2 82 m high The machine was powered by an improved version of the 160 hp (118 kW) Siemens-Bramo

Fl 282B-0
1/72 scale plans



Sh 314E, with the engine located in the central fuselage, behind the pilot. The engine to rotor reduction gear was 1:12.2. The engine was cooled by a wooden 12-blade fan. The blades of the lifting rotor were of mixed construction, with a steel spar, wooden ribs, and plywood and fabric covering. They were attached to the rotor heads on flap and lead-lag hinges.

The control system of the Fl 282 was a modification of that in the Fl 265, consisting of the control stick (the Fl 265 had a 'hanging' stick, while the Fl 282 featured a standard, 'standing' one), pedals, throttle lever, and rotor rev regulator (nominally 160 rpm). Moreover, the helicopter was fitted with the automatic system to switch the blade pitch to autorotation in case of power failure.

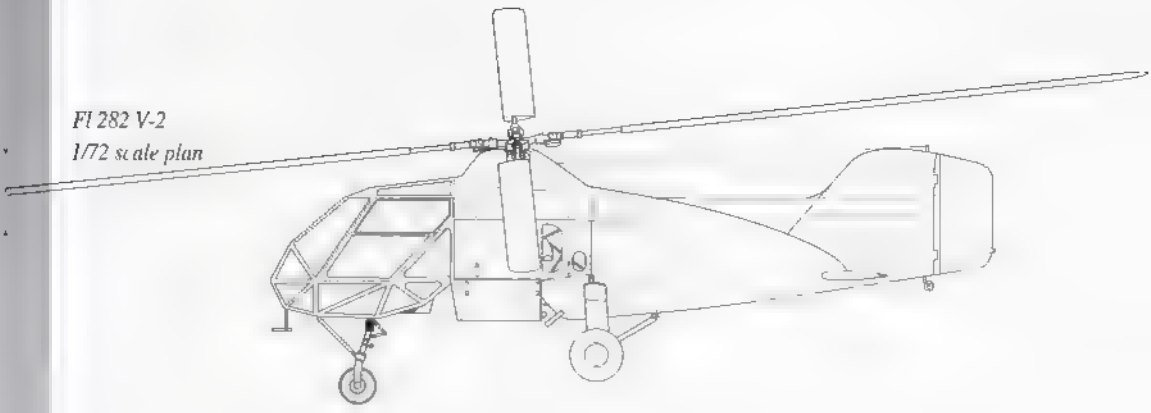
Production of the helicopter started in 1942. The RLM order called for 1,000. The first prototype batch, built at Johannistal (its helicopters being designated with V numbers), included 30 machines. Manufacture of the second batch of 15, called pre-production, was located at Bad Tölz in Bavaria.

To study the fatigue strength of the helicopter's structure, the first prototype, Fl 282 V1, was allocated for ground and tethered tests (today such procedure is standard, but in 1941 this was a novelty), totalling 125 hours 39 minutes. Later on the V4 and V8 were also allocated for ground tests. Upon completion of the ground testing, the company's chief test pilot Ludwig Hofmann made the first free flight in the V2 on 30 October 1941. During factory tests on the third prototype, Fl 282 V3, Hofmann flew it on 26 April 1942 to an altitude of 3,800 m, which was reached 36 minutes after take-off. Hans E. Fuisting was another pilot to participate in Fl 282 tests, and he repeatedly demonstrated the ability of the Fl 282 to continued stable flight with the controls left untouched, as long as the speed did not exceed 60 km/h. He also discovered that the Fl 282 displayed a certain longitudinal instability at speeds in the region of 40 km/h, which disappeared at higher speeds (Fl 282's top speed was 150 km/h).

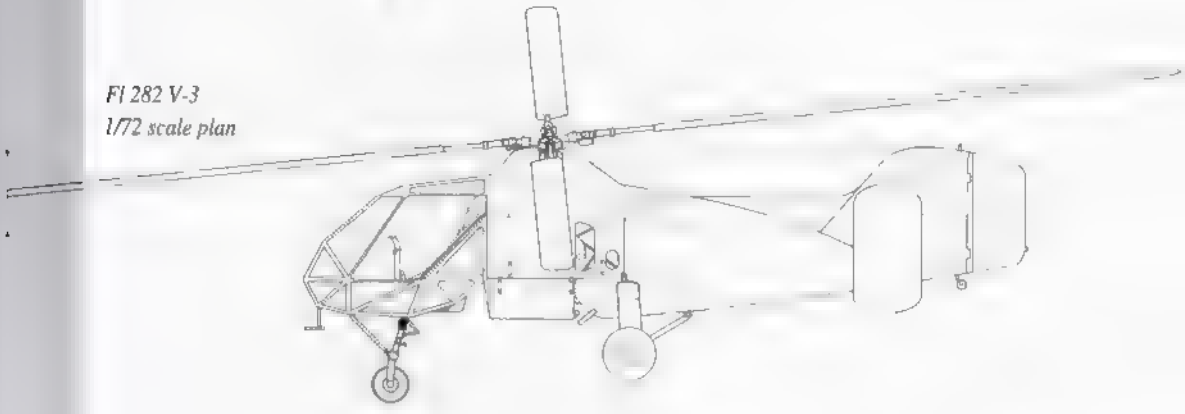
The first four Fl 282 prototypes had tubular spaceframe fuselages with metal covering and glazed cockpits, these were known as the Fl 282A. From the V5 on the cockpit was uncovered, and the fuselage, with the exception of the engine compartment, was fabric covered. This variant was known as the Fl 282B. Individual prototypes introduced a number of changes in the tail unit. The V3 featured additional fins at the tips of the tailplane, while the V23 tested a V-tail. The fin and rudder were wooden, fabric covered.

As an important operational innovation, five prototypes (V20 to V24) were completed as two-seaters, designated the Fl 282B-2. The passenger-observer was positioned aft of the power plant, facing backwards. As this position was usually occupied by a fuel tank, the Fl 282B-2 featured two cylindrical tanks located either side of the pilot's seat instead of the single fuselage tank. With a crew of two the amount of fuel (LO 87 petrol) was reduced from the normal 105 to 64 litres.

Qualification tests of the Fl 282B were not conducted, as was usual for aeroplanes, in the Luftwaffe test centre at Rechlin, but in the naval test centre (E-Stelle) at Travemünde. The AA ship *Greif* anchored there was used for take-off and landing tests. These tests included a special landing technique, especially useful when the ship was rolling and pitching, which consisted of bringing the helicopter down from hovering flight using 10 metres of cable and a manual winch. At Travemünde it was also possible to make test flights over water, for



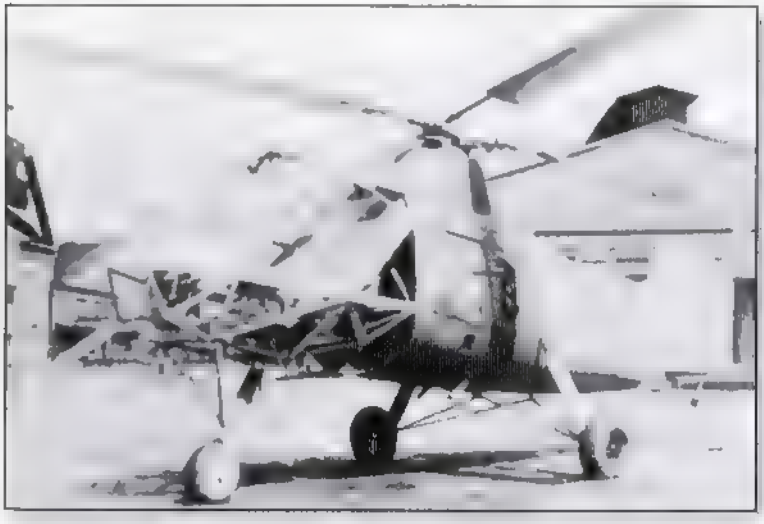
Fl 282 V-2
1/72 scale plan



Fl 282 V-3
1/72 scale plan

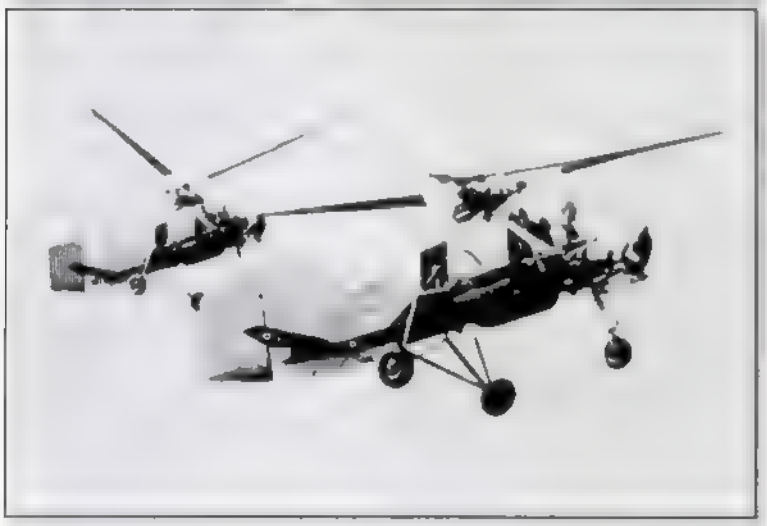
example to drop small depth charges from the helicopter. Some trials were carried out in other locations, however, including Schweidnitz (now Świdnica in Poland). One of the tests repeated the Fl 265B vs Bf 109 experiment of four years before, resulting in an interesting report:

"On 22 June 1944 at Schweidnitz comparison flights were made between the Fl 282B helicopter (Flettner company chief factory test pilot Hans E.



The second prototype Fl 282 V2 with glazed cockpit, first flown on 30 October 1941. [R. Witkowski Archive]

Operational tests of the Fl 282 Kolibri in the Mediterranean were carried out in the summer 1942 from the minelayer Drache and the auxiliary ship Bulgaria (R. Witkowski Archive)

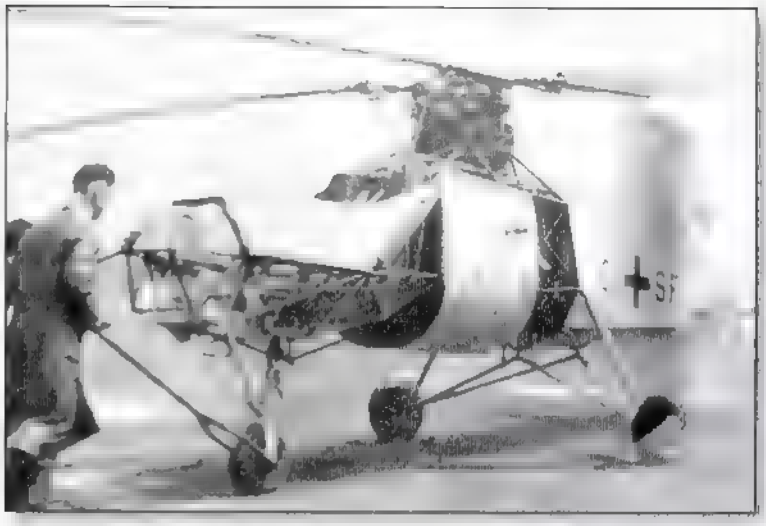


Two Fl 282 Kolibri helicopters flying in formation (R. Witkowski Archive)

Finsting, and a Fw 190 aeroplane (pilot Lt Eisenlohr of the E Kdo 25) aimed at investigating the chances to hit the helicopter by the fighter. Analysis of the film and reports by both pilots are not available yet. It is known, however, that at heights in excess of 100 m the fighter managed once, for a very short time, to catch the helicopter in its sight. But near the ground, and in particular in an area covered with obstacles, the fighter had negligible chance of intercepting the helicopter.

Vulnerability of the helicopter to gun fire was also tested, and before any trials the probability of hitting crucial elements of the rotating rotor was analysed by theoretical calculations. This mathematical analysis showed that the chance of hitting these was much lower than the chance of hitting vital components of an aeroplane's wings. Practical tests were carried out by firing at a *Kolibri* (unmanned, tethered on the ground) with infantry weapons. Despite several hits on the blades, these were not destroyed.

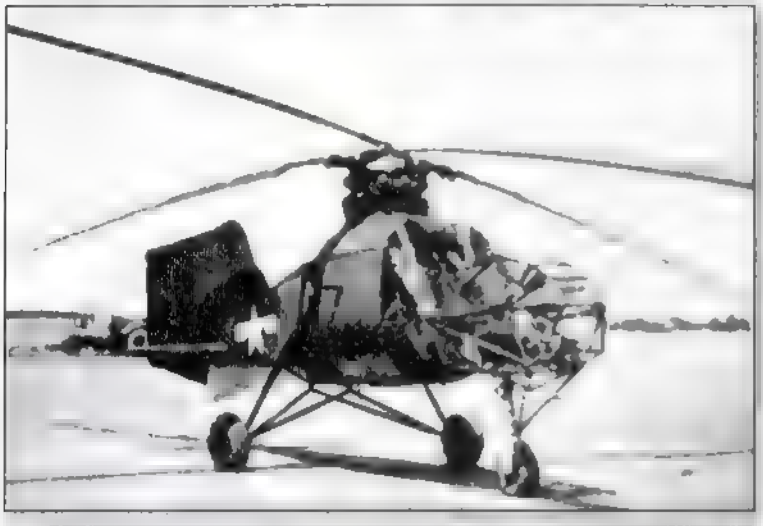
Fl 282 Kolibri pushed manually to the take-off position.
[M. Krzyzan Archive]



Fitting rotor blades to the Fl 282 Kolibri during operational tests in the Mediterranean and Aegean Seas.
[R. Witkowski Archive]

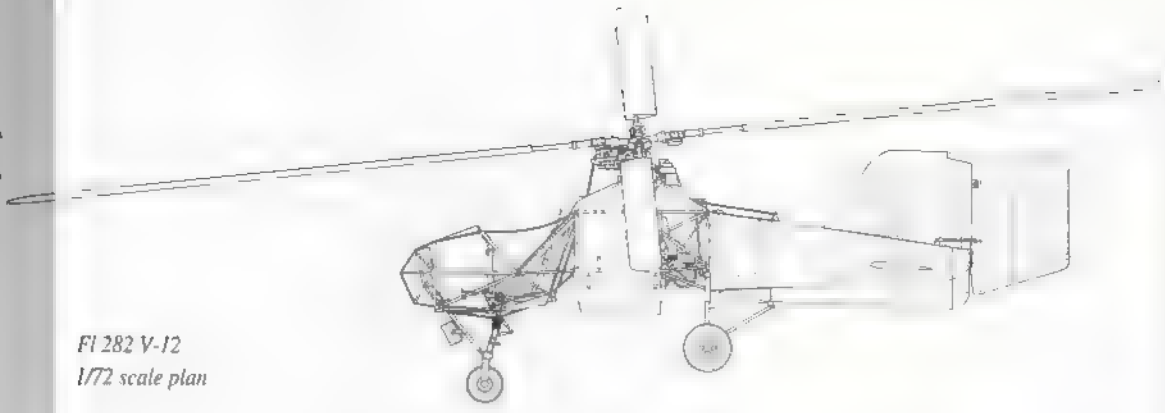
Passenger position in the Fl 282 Kolibri
[M. Krzyżan Archive]

The third prototype Fl 282, V3 GF+YC. Cockpit glazed at the front only
[R. Witkowski Archive].



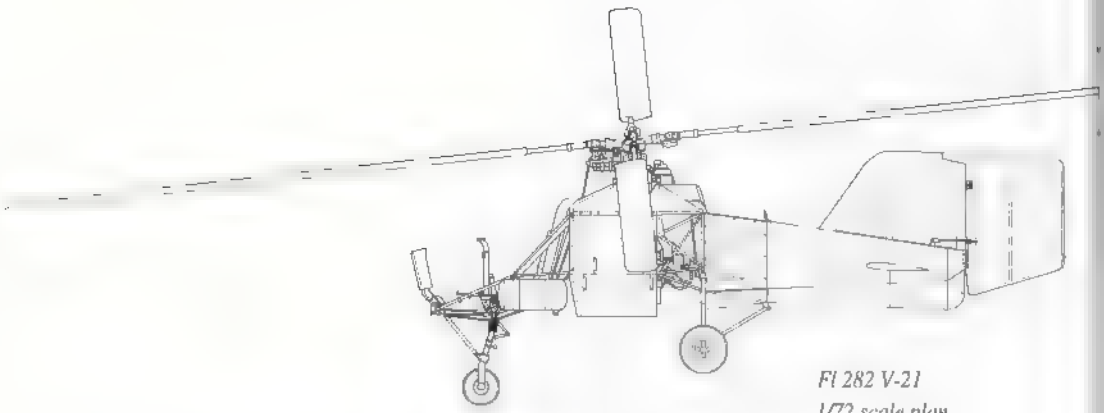
One of the Fl 282 Kolibris (V15 CI+SI) during evaluation in the USA, with American markings.
[R. Witkowski Archive]

October 1944. A batch of Fl 282 Kolibris built at Schweidnitz (now Swidnica in Poland). Anton Flettner is standing in front of the V14, CJ+SH
[R. Witkowski Archive]



Fl 282 V-12
1/72 scale plan

Two views of the crash landing of the Fl 282 V17 on 13 April 1944 at Travemünde
(R. Witkowski Archive)



Fl 282 V-21
1/72 scale plan

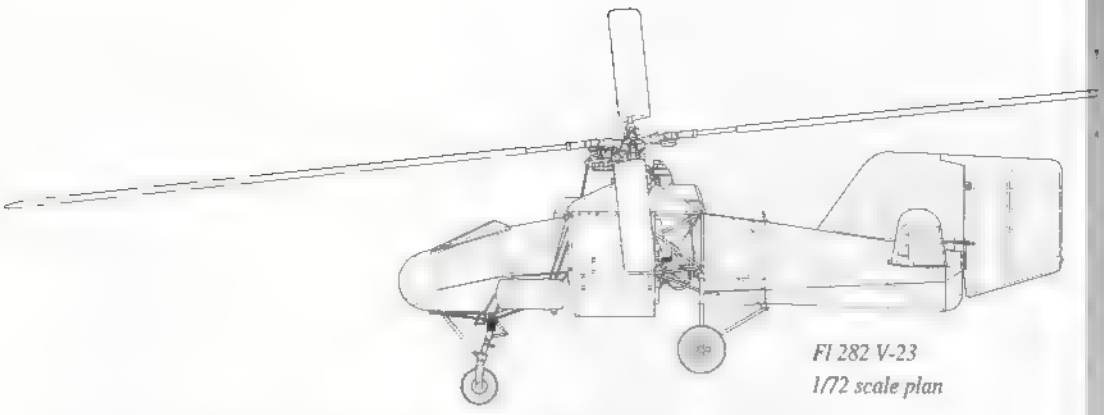
Two-seat Fl 282B V21 in flight
[R. Witkowski Archive]

Two-seater Fl 282B-2 V21 in flight with Anton Flettner as the passenger
[R. Witkowski Archive]

Fl 282 V23 CI+TW during evaluation in the USA, but still with German Luftwaffe markings
[M. Krzyzan Archive]

Fl 282B-2 Kolibri V23 during evaluation in the USA, with postwar American markings
[HelicoRevue]

Fl 282B-2 Kolibri V23 during evaluation in the USA, with American markings
[HelicoRevue]



Fl 282 V-23
1/72 scale plan

Following the promising testing at Travemunde, in October 1942 two Fl 282B *Kolibris*, the V6 and V10 (in reserve), were deployed for trial operations in convoy protection in the Mediterranean and Aegean Seas. The trials

American test pilot Capt. Robert Quigley, who participated in evaluation of the captured Fl 282B-2 Kolibri V23
[HelicoRevue]

continued until the end of January 1943. The V6 was flown by test pilot Hans E. Fuisting. Flying was done from the minelayer *Drache* and auxiliary ship *Bulgaria*. It seems that the trials did not go unnoticed by British intelligence, as both ships were attacked by the RAF several times.

Conclusions from the trials in the Mediterranean and Aegean were promising. The Fl 282 *Kolibri* proved itself a mechanically reliable aircraft, pleasant to fly, able to operate even in the worst weather and gusty winds, although landings in difficult conditions were only possible using the cable winch developed for the purpose. The helicopters operated from 4x4 m take-off platforms fitted 1 m above the deck. Similar operational tests took place in the spring 1943 in the Baltic (Gdynia-Gdańsk region) in co-operation with the 21st U-boat Training Flotilla. The helicopters proved an extremely effective means of detecting submarines, even while submerged. Once a submarine was detected, the helicopter marked its position with special buoys with magnesium torches, and called surface vessels or aircraft to destroy the enemy. During these trials

Fl 282 V23 CI+TW during evaluation in the USA but still with German Luftwaffe markings. The letters FE on the tail meant Foreign Evaluation
[M. Krzyzan Archive]

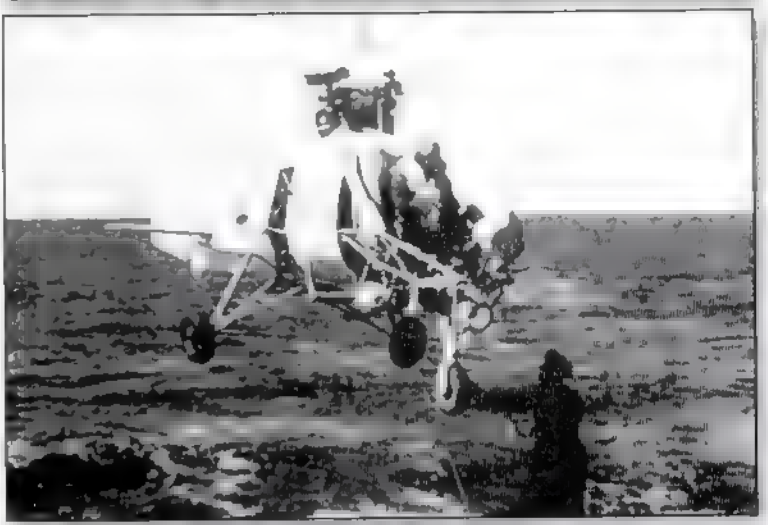
Hauptmann Claus von Winterfeld, in charge of the tests, was killed in the V6 prototype on 10 May 1943.

The effectiveness of the Fl 282B *Kolibri* in naval warfare as shown by the trials led to a decision on 13 March 1943 to form the first Kriegsmarine helicopter unit, Bordfliegerstaffel 3/196 based in Kiel. Its main duty was to train pilots. At the same time designers of new large submarines were instructed to consider placing a helicopter in a special hangar, but the idea was not implemented. In June 1944 the BFS 3/196 was disbanded, and its *Kolibris* (with exception of the V18, left at Travemünde) were allocated for land operations.

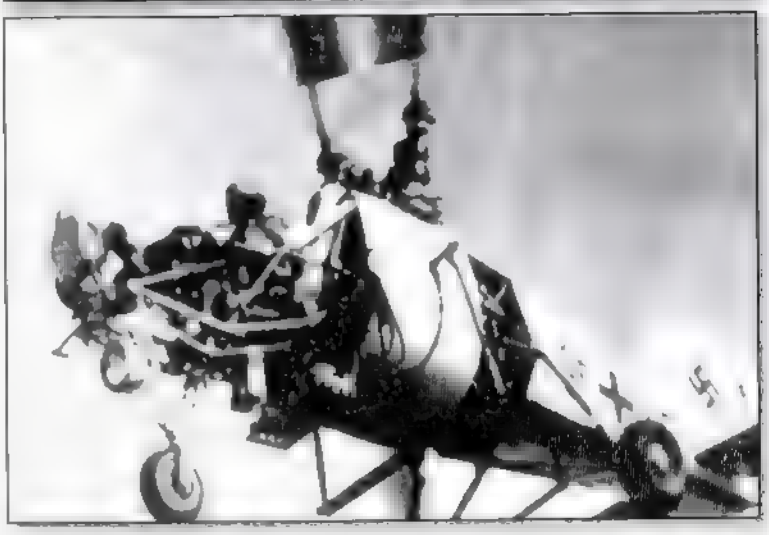
The Fl 282B was able to fly for 95 hours without component replacements or repairs. 50 pilots were trained to fly the helicopter in good and bad weather, although not without accidents. On 10 November 1944 one of the pilots put the helicopter into a steep dive during blind flying training, and while recovering he caused the main blades to hit the tail (after this accident the diving speed was

Fl 282 Kolibri V6 GF+YE during operational tests in the Mediterranean and Aegean Seas in September 1942 (R. Witkowski Archive)

Fl 282 Kolibri V6 GF+YE (piloted by Fuisting) during operational tests in the Mediterranean and Aegean Seas in September 1942 (R. Witkowski Archive)



The Fl 282 V6 GF+YF during sea trials. Note the frame working with the pull-down cable winch (M. Krzyzan Archive)



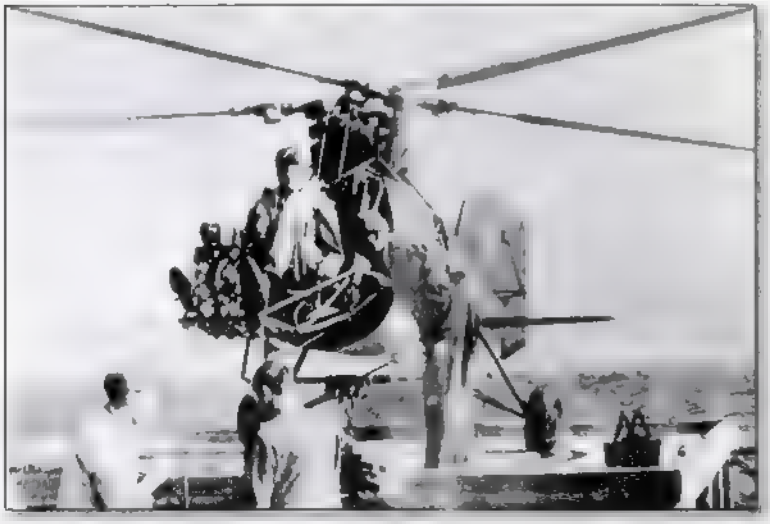
flew to besieged cities, such as Breslau (now Wroclaw in Poland), from which it was apparently a Fl 282B-2 *Kolibri* that evacuated the notorious *Gauleiter* Karl Hank shortly before Soviet troops took the city.

When the Third Reich surrendered in May 1945 the Allies captured only three airworthy Fl 282B 2 *Kolibris*. Two of these, the V15 CI+SI and V23 CI+TW, were handed over, together with Flettner's chief test pilot Hans Ehrenfried Fuisting and mechanic Ing. Xaver Schleicher, for trials in the USA, while the third, V12 CI+SF, was handed over to the Soviets. In the USA testing of the *Kolibris* was entrusted to the Prewitt Aircraft Company, which had had some experience with autogyro construction in the 1930s. The 30 hour trials proved the excellent characteristics and performance of the German helicopter. This information was used in helicopter development in the USA. For example, Kaman used the intermeshing layout for many years, including the popular HH-43B *Huskie* helicopter.

In 1947 Anton Flettner himself arrived in the USA (he became a US citizen a year later), employed as a consultant in the Office of Naval Research. Soon afterwards, in 1949, he established the Flettner Aircraft Corporation at Key Gardens (in Long Island, near New York), and developed two helicopter projects: one, unnamed, with 4-6 seats, and another, designated the Fl 201 *Helicogyro*, being a helicopter-autogyro hybrid, for 30-40 passengers. Neither of the projects was built. In the mid-1950s Flettner developed diagnostic methods for helicopter gearboxes for the US Army. In recognition of his achievements, he was made an honorary member of the American Helicopter Society and the Convertible Aircraft Pioneers association.

The two closest co-workers of Flettner, Hohenemser and Sissingh, were also brought to the USA. The former then worked for many years at McDonnell Aircraft Corp., and subsequently was a professor at Washington University in St Louis, while the latter was initially employed by the Kellet company (which worked on two lateral layout helicopters called *Synchrocopters* and designated XR-8 and XR-10), and then by the Hiller United Helicopter Corporation.

Anton Flettner, the creator of the most efficient helicopter of WW2, died in a New York hospital on 29 December 1961, aged 76.



Test pilot Fuisting during operational tests of the Fl 282 V6 GF+YF in the Mediterranean and Aegean Seas.

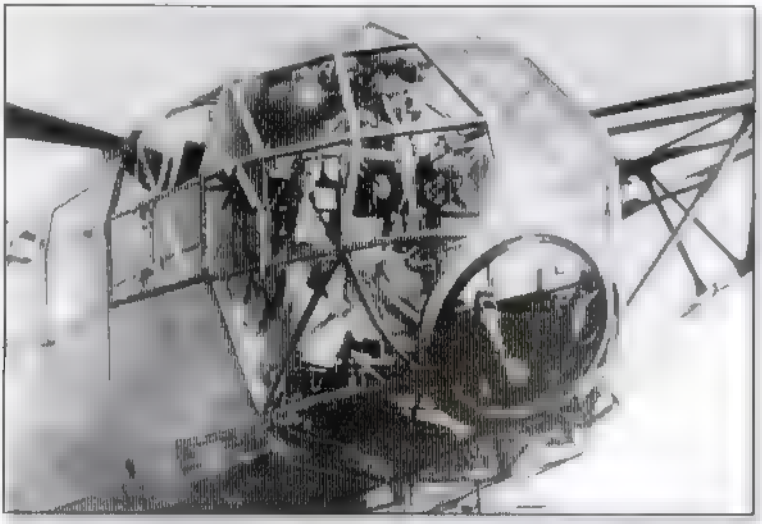
[R. Witkowski Archive]

Drache (Dragon)

Henrich Karl Johann Focke (1890-1979). [Arch. R.Witkowski]

The Fa 223 *Drache* (Dragon) helicopter designed by Henrich Focke was, after the Fl 282 *Kolibri*, the second helicopter in the history of aviation used in actual military operations, even if only on a limited scale. The Fa 223 *Drache* proved in practice the usefulness of the helicopter in such roles as transport from inaccessible places, rescue operations, and as a flying crane. One example of this helicopter was used for nearly 200 flying hours, collecting considerable operational experience.

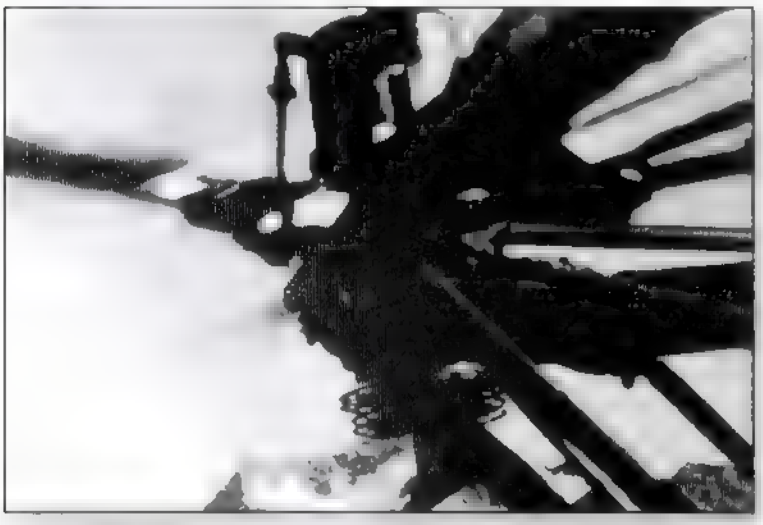
The idea of building a utility helicopter, based on the experience of flying the experimental Fw 61, was put forward in Germany in 1937. Two projects were considered. One was the civil 6-seat Fa 266 *Hornisse* (Hornet) helicopter for Deutsche Lufthansa airlines, powered by a 800 hp (589 kW) engine, while



Forward fuselage of the Fa 223 Drache [Carbonel via Air Magazine]

Forward fuselage of the first prototype Fa 223 V1 D-OCEB. Test pilot Karl Bode is in the cockpit [M. Krzycan Archive]

Fa 223 Drache during factory test flight, still without any markings
[M. Krzyzan Archive]



Rotor head of the Fa 223 Drache seen during operational tests in the Alps, September 1944
[M. Krzyzan Archive]

Fa 223 Drache during an overhaul in the field
[Carbonel via Air Magazine]

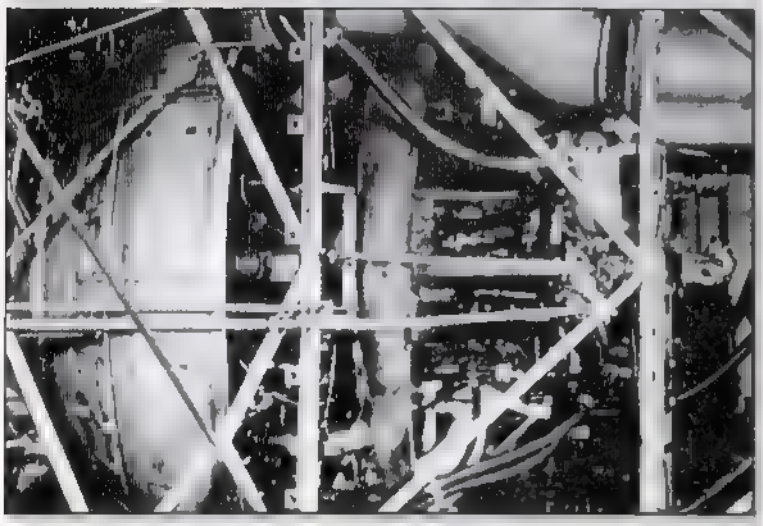
The first prototype Fa 223 V1 [Carbonel via Air Magazine]

the other was a two-seat training helicopter, the Fa 224 *Libelle* (Dragonfly), powered by a 240 hp (177 kW) engine. The training helicopter was going to be a slightly enlarged version of the Fw 61, with a cockpit for two pilots side-by-side. In 1938 it was decided, however, that instead of the two civil helicopters only one would be developed, for the air force. The new machine was designated the Fa 223. Its specification called for a useful load of at least 700 kg, top speed of over 160 km/h, and dual control training capability.

The first prototype, the Fa 223 V1 (with civil registration D-OCEB), powered by the 1,000 hp (735 kW) BMW Bramo Fafnir 323D engine, was completed in September 1939. 100 hour ground tests commenced immediately, followed by tethered flights. After these were completed, on 12 June 1940 test pilot Flugkapitän Dipl. Ing. Karl Bode made the first free flight at the premises of Focke-Achgelis & Co GmbH at Delmenhorst, near Bremen. The Fa 223 proved an equally successful design as the experimental Fa 61, and the performance of the new helicopter largely exceeded the requirements: top speed of 182 km/h and cruising speed of 120 km/h, climb rate of 8.8 m/s, ceiling 4,880 m, range 320 km. Maximum take-off weight was 4,310 kg, and the useful load was 1,100 kg.

The first prototype Fa 23 V1 before take-off. [M.Krzyzan Archive]

Test pilot Hans Helmut Gerstenhauer in the cockpit of the Fa 223 Drache
[M. Krzyzan Archive]



BMW Bramo Fafnir 323D engine mounted inside the fuselage of the Fa 223
[M. Krzyzan Archive]

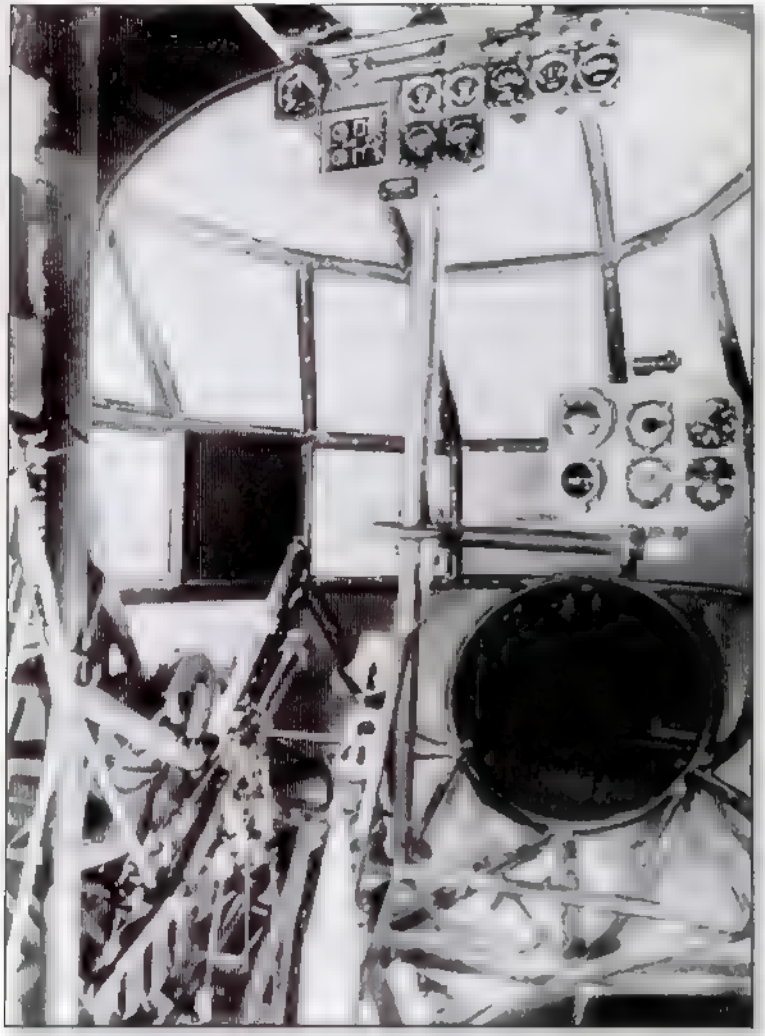
A dramatic episode during flight tests of the Fa 223 took place on 5 February 1941. That day, having made 115 flights, the V1 prototype during transition from powered flight to autorotation at an altitude of 1,500 m had one of the rotor pylons break off. Karl Bode bailed out safely from the damaged machine at 700 m, but the observer was killed. The destroyed prototype was replaced in testing by two others, the Fa 223E V2 with civil registration D-OCEW, and the pattern machine of the production version, the Fa 223E V3, finished in military markings. Compared to the V1, both the V2 and V3 had different shape nose of the fuselage and altered cockpit glazing. As the V2 and V3 entered tests the Fa 223 was given the name *Drache* (Dragon). The fourth prototype, the Fa 223E 0 V4 (D-OGAW), was given tear-drop shaped wheel spats.

In the version approved for series manufacture the first RLM order called for 100, of which 30, still designated as experimental (V) machines, were to be used for development work and operational testing.

Tail surfaces of the first prototype Fa 223 V1
[M. Krzyżan Archive]

The Fa 223 *Drache* had the same lateral layout as the Fw 61, with two 3-blade rotors set on tubular spaceframe side pylons. It differed from its predecessor in its size, weight, and engine power. The fuselage, welded from chromium-molybdenum tubes and fabric covered, housed the cockpit with the pilot and navigator in its nose section, followed by a cargo hold with a 490-litre fuel tank, and the engine compartment for the 1,000 hp (735 kW) air cooled Bramo Fafnir 323Q-3. The fuselage ended with an orthodox T-shaped aeroplane-type tail. The aircraft sat on a tricycle undercarriage.

The controls in the cockpit consisted of the control stick, pedals, engine throttle lever, and trimming wheels. Pitching of the helicopter was accomplished by swash plates, rolling by differential collective pitch control of the rotors, and turning by opposed deflection of the swash plates. The total thrust of both rotors was controlled initially by rotor revs, and subsequently (from the V13 on) a two-position collective pitch lever (one position for powered flight, the other for autorotation) was introduced. Only one machine, the Fa 223 V16, had



Pilot's seat in the cockpit of the Fa 223 Drache [Carbonel via Air Magazine]

an experimental lever that coupled the changes of the collective pitch with the engine throttle control

The rotor blades of the Fa 223 *Drache* had mixed construction, with a steel spar, 36 wooden (pine) ribs and plywood fabric covering. They were attached to the rotor heads on flap hinges and lead-lag hinges, fitted with friction dampers. Apart from the angular gearboxes, changing the direction of drive on the shaft from the engine, the rotor heads included the idle gear mechanism and automatic devices to switch blades to autorotation angles in case of power failure

Allied bombing delayed the start of production In June 1942 the factory at Delmenhorst was completely destroyed, together with two prototypes, the V2 and V3, and with seven helicopters of the development batch A similar fate befell the factory after it was moved to Laupheim near Stuttgart, when only seven helicopters (V11–V17) survived the bombing in July 1943 These were allocated for operational tests During 11-12 May 1944 the Fa 223 V14 DM+SR was used for rescue work in a marshy area in Holland (a Do 217 crashed there, and the

Fa 223 V14 Drache DM+SR operating as a flying crane in the marshes in Holland in 1944.
[M. Krzyzan Archive]

V11 DM+SO was seriously damaged during an attempt to save its crew). Then, between 6 September and 5 October 1944, the Fa 223 V16 DM+ST was used in experimental mountain operations at Mittenwald, near Innsbruck in Austria. These included transporting a complete mountain gun, weighing 840 kg, to a position at 2,800 m; normally such an operation (transporting a dismantled gun) involved 20 men and took 36 hours.

After Laupheim was bombed, production of the Fa 223 *Drache* was moved to the Weserflug plant at Tempelhof in Berlin. By the end of January 1945 four Fa 223Es had been assembled there. Only one of these, factory no. 00051, flown by Hans Helmut Gerstenhauer, managed to fly from Berlin southwards, via Mühldorf to Ochsenhausen, to enter service with the Luftwaffe. The three remaining helicopters (factory nos. 00052-00054) were captured by the Soviet Army, together with 30 machines in various stages of completion.

By the end of the war the existing fleet of Fa 223 *Draches* had been used to train a total of 26 pilots. Training of each of them was completed with an autorotation landing. Only one accident happened during training where one overturned after an unpowered landing.

At the end of 1944 only five Fa 223E *Draches* were still airworthy, as the Fa 223 V12 crashed during a rescue operation on Mont Blanc, while another helicopter was destroyed on the ground. In April 1945 three helicopters were allocated to a special transport unit, the Lufttransportstaffel 40 (which also included five Fl 282B *Kolibri* helicopters), its tasks including flights to besieged or threatened cities. One such missions was flown by a Fa 223E *Drache* (factory no. 00051) during late February/early March 1945 in Polish territory.

During the operation the crew of the helicopter, certain that the chances of success were minimal, called themselves '*das Himmelsfahrtskommando*' (heaven-bound squadron). The helicopter was flown by Leutnant Hans Helmut Gerstenhauer, the factory test pilot mentioned before, who was posted to *Luft-transportstaffel 40*. An aircraft engineer, graduate of the engineering college at Strelitz in Meklemburg, he was 30 in 1945 and was most certainly among the most experienced German helicopter pilots. His links with rotary-wing flying commenced in 1942 when, ordered by Dipl. Ing. Karl Bode, the Focke-Ach-

gelis chief pilot, he was sent to occupied France, to the aerodynamic institute at Chalais-Meudon, to learn to fly the Fa 330 *Bachstelze* U boat observation gyroglider in the large wind-tunnel there. After this 'tunnel' course Gerstenhauer performed the experimental flights of the gyroglider towed behind a motor boat at Travemünde Between January and September 1943 he was responsible for 'test-flying' of production Fa 330s in the tunnel at Meudon Strangely, he had never flown the Fa 330 on tow behind a U-boat, these operational tests being made by Kriegsmarine test pilots

Following the Fa 330 development programme, in 1944 Leutnant Ing. Gerstenhauer was posted to the team that carried out operational tests of the Fa 223 *Drache* Among others, he performed the test flights in the Austrian Alps (as mentioned above), where experimental transports of external loads and rescue missions at great heights (up to 2,300 m above sea level) were flown In early 1945 he was re-posted to Lufttransportstaffel 40 at Mühldorf in Bavaria, commanded by Hptm. Josef Stangl.

By special *Führerbefehl* (Fuhrer's orders) Gerstenhauer was instructed in the last days of February 1945 to fly to Graudenz (Grudziądz in Poland), besieged by the Red Army. He started from Ochsenhausen in Austria on 26 February in Fa 223 GW+PA (with a crew consisting of flight engineer *Meister* Möller and his assistant *Feldwebel* Friedrichs). Having covered (with many problems)

Fa 223 V14 Drache DM+SR taking off for a rescue action in the marshes in Holland in 1944
[M. Krzyzan Archive]

Fa 223 V14 Drache DM+SR operating in the marshes in Holland in 1944 The crashed Do 17 can be seen on the left
[M. Krzyzan Archive]

Fa 223 Drache V14 flown by Hans Helmut Gerstenhauer approaches the Alpine shelter-house Dresdner Hütte, 19 September 1944
[M. Krzyzan Archive]

the route via Crailsheim, Giebelstadt, Würzburg, Meiningen, Erfurt, Kolleda, Werder near Potsdam, Prenzlau, Stettin (Szczecin in Poland) and Stolp-Reitz (Redzikowo near Słupsk in Poland), they reached Danzig-Praust (Pruszcz Gdanski in Poland), their last stop before the destination, in the evening of 1 March 1945. There they found out that landing in the centre of Graudenz was impossible because of the tight Soviet encirclement, which left only the old Citadel in German hands. The garrison surrendered on 5 March.

Before the helicopter returned home, it flew from Praust on what must have been the first helicopter rescue mission in Europe. On 6 March a pilot from the locally based 1./NAGr 4, while returning from a sortie, failed to locate his base in a snowstorm and was forced to land in a field. Gerstenhauer took off to search for him, managed to locate the damaged Bf 109 and bring the wounded pilot back to base, from where he was taken to a hospital. Faced with the advancing Soviet forces, the Fa 223 *Drache* left the same day for Gotenhafen-Hexengrund (Gdynia-Babie Doły in occupied Poland), where he landed at 16.35.

The helicopter flew back to Germany, leaving Gdynia and heading for Stettin over the sea, as the route over land was no longer available, Soviet and Polish troops having broken through the German lines in the area. The flight was dramatic, as it was made at an altitude of 10-20 m above water, and the distance

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Fa 223 V14 Drache DM+SR in the process of lifting part of the crashed Do 17 in Holland in 1944.
[M. Krzyżan Archive]

- Fa 223 V14 DM+SR, with the crew of Lt. Ing. Hans Helmut Gerstenhauer and flight engineer Hauptfeldwebel Friedrich Will,
- Fa 223 00051 GW+PA, with pilot Hauptingenieur Otto Dumke and engineer Ing. Heinz Zelewski,
- Fl 282 V15 CI+SI, with a civil pilot Flugkapitän Hans-Ehrenfried Fuisting and flight engineer Ing. Xaver Schleicher, and
- Fl 282 V23 CI+TW, with pilot Feldwebel Ernest-Willi Reiman and engineer Ing. Wilhelm Deilitz.

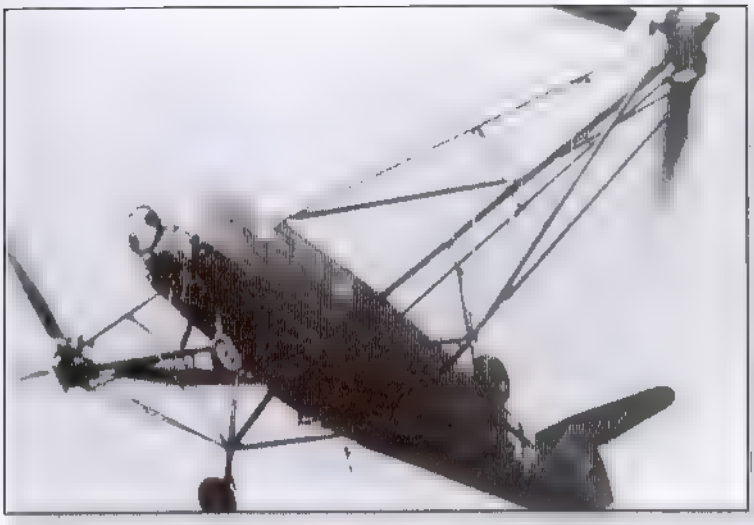
The convoy was escorted by a US Piper L4 that carried Capt. Bennett, USAAF, in command of the whole operation, and three NCOs. Upon landing at Munich the helicopters, still adorned with Luftwaffe black crosses, were surrounded by Military Police, as they were considered to be renegades that had refused to surrender! The confusion was only rectified when the Piper landed. The black crosses were immediately replaced with US stars and by British roundels in the case of the Fa 223 V14. The *Kolibris* and a Fa 223 were also given new US identification numbers. Fl 282 V15 - FE-4614, Fl 282 V23 - FE-4613 and Fa 223 00051 - FE-4616 (FE denoting Foreign Evaluation)

Misunderstandings regarding the further fate of the captured helicopters did not end there, however. Having arrived at Nellingen near Stuttgart, the helicopters and their crews would spend four weeks awaiting further decisions. Then it suddenly transpired that the helicopters had to be ferried to Kassel, to be disassembled and shipped - all of them! - to the USA. During that flight the 'Graudenz' Fa 223, the one in US markings, was forced to land due to mechanical failure of one rotor head. As the problem proved impossible to repair, since no spare parts were available, a group of experts brought from Ochsenhausen disassembled the helicopter in the field and prepared it for subsequent transport in crates. It was shipped to the USA, but it is not known if the helicopter was repaired there, or if it flew again

New orders regarding the fate of the remaining machines finally came on 15 June. All three helicopters were supposed to be ferried to Paris. The route via Strasburg, Nancy, St Dizier, and Romilly to Paris-Villacoublay (550 km) was covered by the helicopters in 5 hours flight. The following day they were told to fly via Caen to Cherbourg. When the helicopters reached the city it turned out that the previous arrangements regarding the allocation of the helicopters to the Americans and the British had been changed again. The crew of the Fa 223 was instructed to return to Germany. The Flettner helicopters, on the other hand, were disassembled and crated for shipment to the USA.

The return flight of the last Fa 223 *Drache* commenced on 20 June 1945. It was notable that the PoW Gerstenhauer flew without any escort. His only protection in case of a forced landing was a 'safe-conduct' pass from the US Army.

When the helicopter reached its first stop at Paris-Villacoublay the crew was in for a nasty surprise US Military Police refused to accept the 'safe-conduct' pass and arrested Gerstenhauer with his crew (two German engineers, Will and Zelewski), placing them in a military prison at St Germain-en-Laye. The Germans were kept there until the end of July, until they were taken care of by RAF officers, as the Fa 223 V14 DM+SR was indeed going to Britain, and without the German pilot and crew this would be rather difficult..



Fa 223 V14 Drache DM+SR
[R. Witkowski Archive]

Fa223 Drache V16 during experimental mountain operations in the Alps, September 1944
[Carbonel via Air Magazine]

Fa 223 Drache V14 at Mittelwald airfield, 1945.
[M. Krzyzan Archive]

Subsequent weeks were spent preparing the helicopter for the trip, interrupted by demonstrating it in flight to various prominent guests. These included Larry Bell president of Bell Corporation, working at the time on their own prototype helicopter the Model 47, and the company's chief test pilot Jack Woolams.

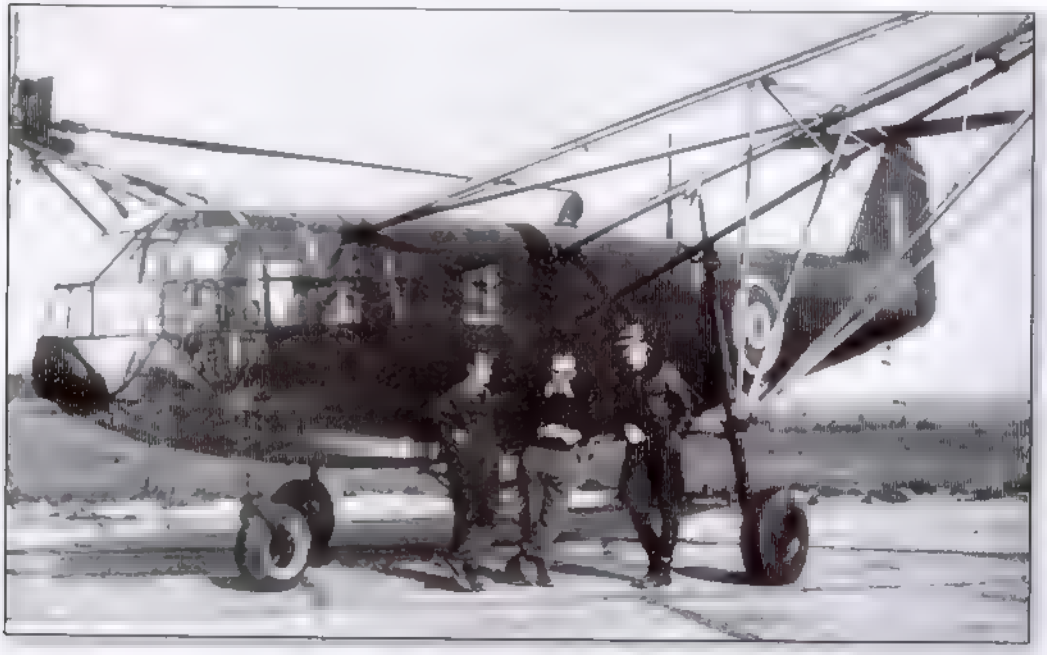
Inspection of the helicopter was completed by mid-August, including all the required servicing and adjustments, except one. Due to the absence of an original extensometer, one important tension member of the engine mount was adjusted only 'by feel', and this would prove critical.

The flight to Britain commenced on 4 September. The helicopter crew consisted of the pilot Hans Helmut Gerstenhauer and two RAF officers, a helicopter pilot (with Sikorsky R-4 experience) F/Lt Dennis, and engineering officer F/Lt Morris. The helicopter was escorted by a British aeroplane which carried, among others, both German engineers, Heinz Zelewski and Fritz Will. The route was from Paris to Beaulieu near Southampton, with a stop at Le Havre. Due to worsening weather the flight had to be stopped at Abbeville.

The Fa 223 V14 took off for another leg from Abbeville on 6 September 1945 at 17:10. This time the weather was favourable, with visibility in excess of 4 km. Soon after leaving France the crew saw the white cliffs of Dover. The British coast was crossed at Folkestone, and the first landing on British soil took place at 18:20 at Lympne airfield, adjacent to the port. 36 years after the famous flight of Louis Blériot, the English Channel was crossed by a helicopter for the first time. Nearly 17 years before, on 18 September 1928 the Channel had been crossed by an autogyro, the C.8L-III flown by Juan de la Cierva.

That same day the helicopter, escorted by an Avro Anson, reached the Airborne Forces Experimental Establishment at Beaulieu, Hampshire, ending its 2600 km voyage.

Fa 223 V14 and its German crew after arrival at the AFEE Beaulieu, September 1945. At far right is the test pilot Hans Helmut Gerstenhauer [R. Witkowski Archive]



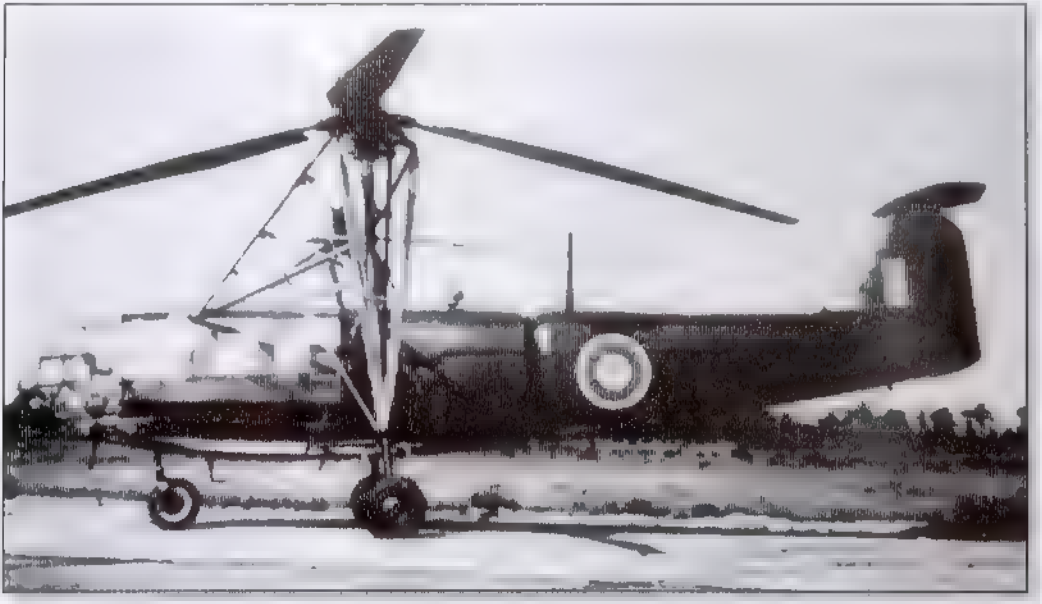
During the weeks that followed the helicopter was subject to detailed inspections by RAF specialists. Before any systematic flight testing commenced, the helicopter flew a series of demonstration and introduction flights, which, despite the protests of the pilot, often involved more than the allowed three people on board.

On 3 October 1945 at 15 00, during one such non-research flight, the Fa 223 carried Gerstenhauer as the pilot plus three British officers, AFEE test pilot Oliver 'Fitz' Fitzwilliams in the starboard observer's seat, O'Hara, the head of the establishment, and Jennings, an engineer from the Air Ministry, in the passenger compartment. While hovering at 60 ft (about 18 m) both rotors suddenly switched to low pitch, as if for autorotation. The helicopter hit the ground violently. Although those on board were only slightly injured, the machine was so seriously damaged (assesed at 70%) that it could not be repaired. It was scrapped.

Subsequent investigation proved that the accident was due to incorrect adjustment of the above mentioned engine mount tension member, which led to activation of the Fa 223's automatic system for uncoupling the power plant from the rotors, and switching the blades to autorotation angle. Had this happened at higher altitude or in forward flight, the incident would have ended in an autorotation landing, but from such a low height an accident was inevitable.

This was the end of the second odyssey of the last Fa 223 V 14 helicopter and its German crew. Lt. Ing. Hans Helmut Gerstenhauer was released from captivity in April 1946. He never flew helicopters again. He worked for MBB during tests of the VJ 101 VTOL aircraft and the *Tornado* strike aircraft. He retired in 1980, and lives in southern Bavaria.

After the war, having left France, Henrich Focke worked in Brazil where he designed the helicopter *Beija Flor*. He then returned to Germany, and in 1958 he participated in development of the Borgward-Focke *Kolibri* helicopter. He died in 1979, aged 88.



Fa 223 V14 with British roundels (in the Luftwaffe it was coded DM+SR) after arrival at the AFEE Beaulieu, September 1945 [R. Witkowski Archive]

Fa 223 Drache V14 DM+SR before the flight to England at the airfield Aarring in Austria 1945

[Carbonel via Air Magazine]

Fa 223 Drache V11 DM+SO, damaged during rescue operation in Holland in May 1944, being overhauled in the field

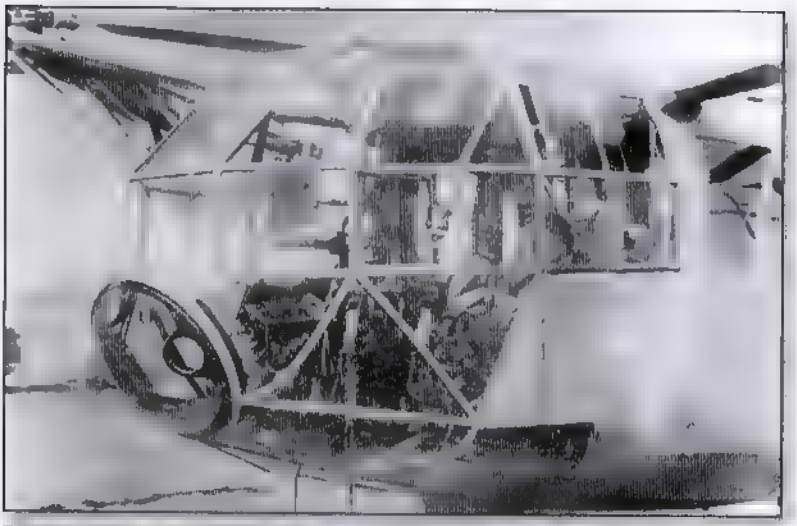
[Carbonel via Air Magazine]

Fa 223 Drache V11 DM+SO during an engine exchange in the field

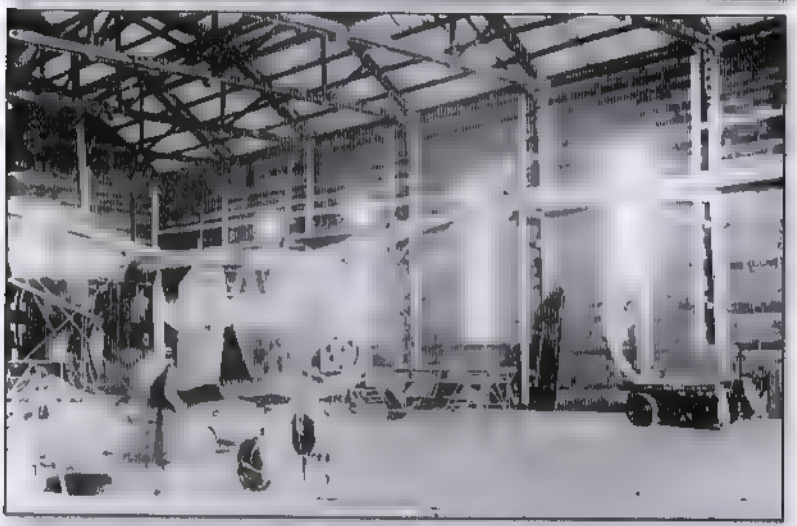
[Carbonel via Air Magazine]

Fa 223 Drache V16 DM+ST at the airfield Aunring in Austria, 1945

[Carbonel via Air Magazine]

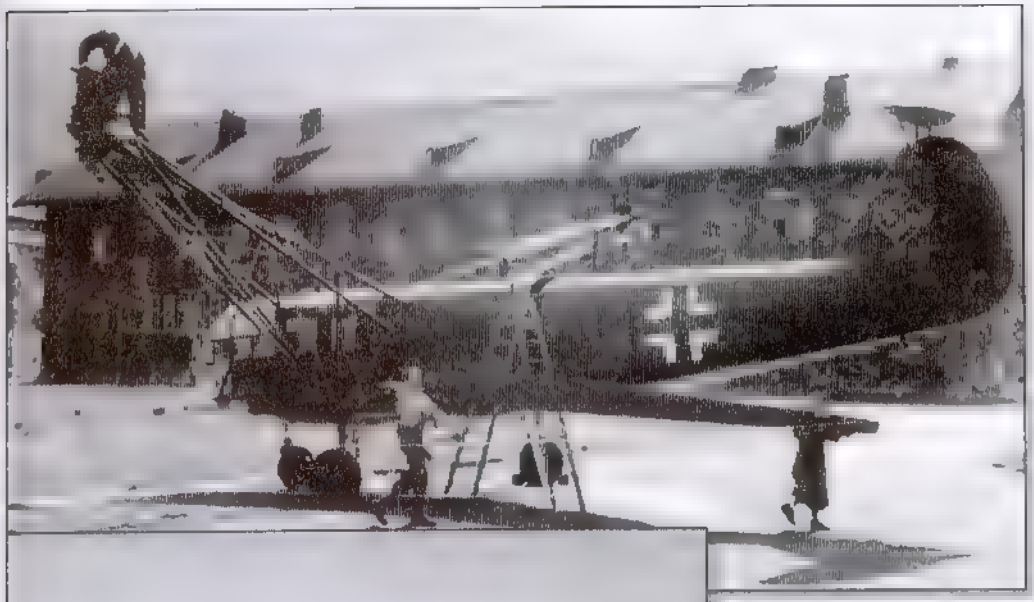


Glazing of the Fa 223 V11 cockpit
{Carbonel via Air Magazine}

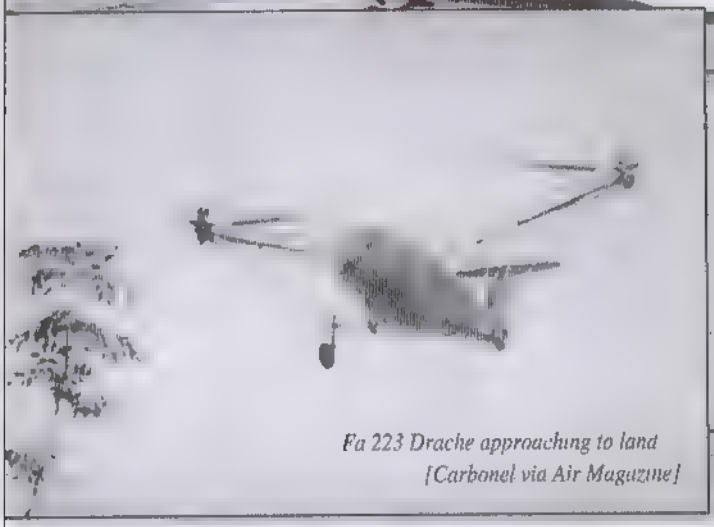


The Graudenz/Danzig Fa 223 Drache GW+PA in the hangar
{Carbonel via Air Magazine}

Two-person crew in the Fa223 V14 cockpit
{Carbonel via Air Magazine}



Above *Fa 223 Drache V16 DM+ST, having rotor blades changed*
[Carbonel via Air Magazine]



Fa 223 Drache approaching to land
[Carbonel via Air Magazine]

Below: *Fa 223 Drache V16 DM+ST during experimental operations in the Alps, September 1944*
[Carbonel via Air Magazine]

submarine. The company accepted the order and soon the Fa 330 *Bachstelze* (Wagtail), designed by Prof. Henrich Focke, was test flown with wheeled undercarriage on the factory airfield. The first test flights were made on tow behind a lorry.

Design of the *Bachstelze* was very simple. The 'fuselage' of the gyroglider was composed of two steel tubes, one horizontal and one vertical. The horizontal tube featured a pilot's seat, a set of flying controls (stick and pedals) and a small instrument panel at the front, and tail surfaces with a small tailplane and a rudder at the rear. The vertical tube aft of the pilot's seat provided support for the 3-blade, freely rotating 7.313 m diameter rotor. The gyroglider sat on tubular skids, wheels being used only in the prototype. Empty weight of the machine (less pilot) was 82 kg. The entire structure was easily disassembled, to be stored in two barrel-shaped containers in the U-boat.

Rotor blades had steel tube spars and plywood ribs, covered with plywood and fabric. The blades were attached to the rotor head on flap and lead-lag hinges.

Prototype gyroglider Fa 330 Bachstelze on wheeled undercarriage.
(M. Krzycan Archive)

Production version of the Fa 330 Bachstelze.
(R. Witkowski Archive)

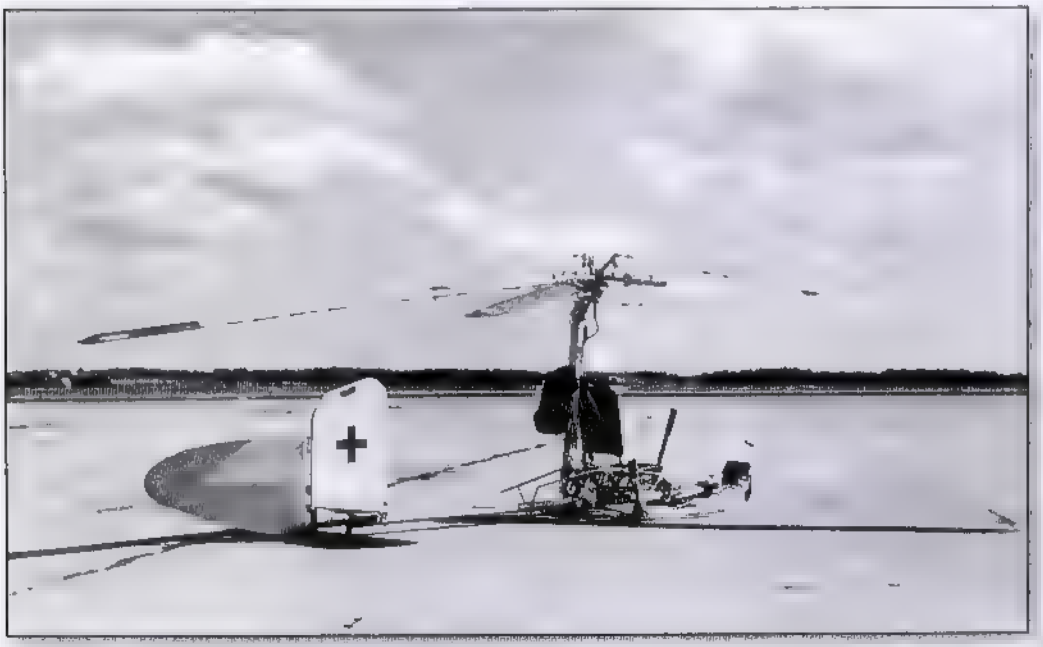
fitted with simple friction dampers. Pitch was adjusted before flight. Blades were fitted with cable anhedral limiters. Longitudinal and lateral control of the rotor was done by tilting the rotor head with the stick, directional control was by rudder, moved by the pedals. The rotor was initially run up by the 'spool' method, using cable wound on the drum under the rotor head, or manually when the wind force was sufficient. In flight the rotor speed was 205 rpm.

Production of the Fa 330 *Bachstelze* was carried out in the Weser-Flugzeugbau factory at Hoykenkamp near Bremen, which eventually built about 200. The last Fa 330 production batches were fitted with 8.53 m diameter rotors. Oddly, factory test flights of the newly built gyrogliders were not made on an airfield on tow behind a lorry (due to problems with the take-off run on skids), but in the large wind-tunnel at Chalais-Meudon in France. They were 'flown' by one of the most experienced rotorcraft pilots of the Luftwaffe, Hans Helmut Gerstenhauer. In the same wind-tunnel the test pilot trained Fa 330 pilots for the Kriegsmarine.

The Fa 330 *Bachstelze* had very good flying characteristics, the pilot could safely let the controls go for up to 10 seconds. It was towed on a 150 m cable, allowing it to reach an altitude of 120 m above the deck of the U-boat. Its optimum speed was about 40 km/h or 22 knots, but flying was possible from a minimum speed of 27 km/h or 15 knots.

It was assumed that the gyrogliders would be employed on the ocean-going Type IX U-boats, able to reach 18 knots on the surface. Also some Type IX-D/2 supply U-boats were also modified to carry the Fa 330. Little is known about the operational use of the Fa 330 *Bachstelze*, but it is certain that they were not very popular with the submarine crews. Although it gave the advantage of observation over greater distances, it also entailed dangers in the event of an emergency dive. Bringing the Fa 330 down on the deck could take too much time. In such a case the pilot was supposed to jettison the rotor blades and bale out'

Production version of the Fa 330 Bachstelze [R. Witkowski Archive]

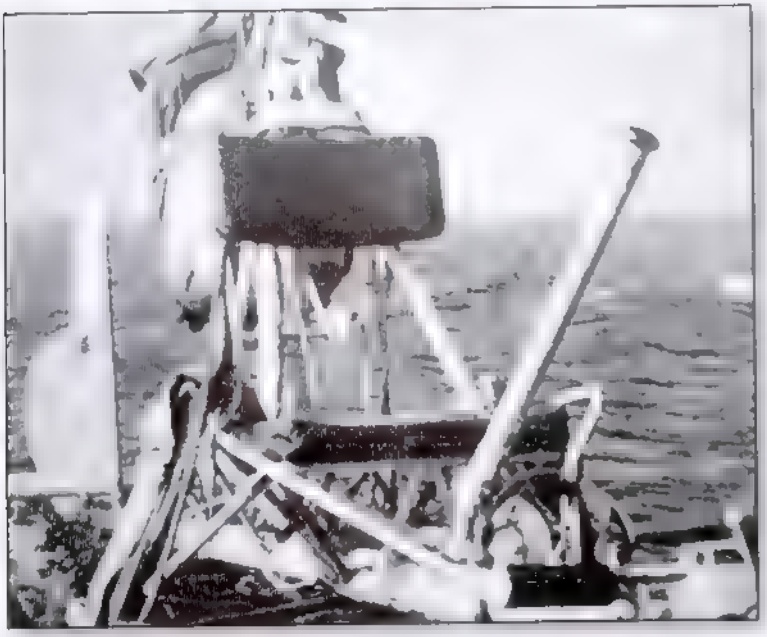


It was probably due to the dislike of the U-boat crews that Fa 330 *Bachstelze* were used operationally only sporadically, in the South Atlantic, in the Gulf of Aden, and in the Indian Ocean. Sorties by the Fa 330 from U-861 off Madagascar are the best known.

There are numerous Fa 330 *Bachstelzes* on display in a numbers of aircraft museums. (See page 94)

U boat sailors assemble the Fa 330.

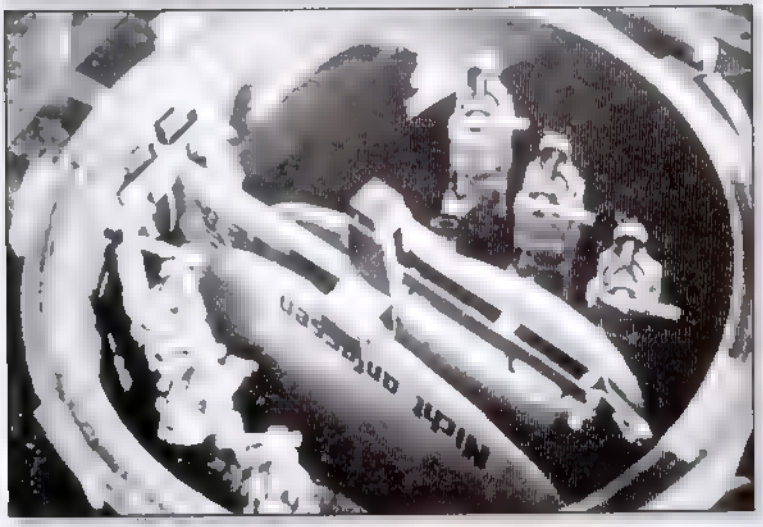
[Signal]



The pilot's seat and control stick.

[Signal]

Pilot of the Fa 330 Bachstelze in flight on tow behind a U boat.
[Signal]



Fa 330 Bachstelze components in a container on a U boat
[Signal]

Projects

Apart from the rotorcraft described in the previous chapters, which were put into production and limited operational use, German designers (and Austrian designers working for the Third Reich) also planned other rotary wing machines, which existed only as experimental prototypes or wind-tunnel models, or even remained on paper.

von Doblhoff

Helicopters of the Austrian baron Friedrich von Doblhoff ended their development as experimental prototypes, so they have to be seen as unfinished projects. The designer had long been interested in the concept of direct rotor propulsion, free from reactive torque, as attempted in the 1930s by Curtiss and

WN 342, von Doblhoff's experimental helicopter of 1943.
[M. Krzyzan Archive]

Bleecker in the USA, Anton Flettner in Germany, and Vittorio Isacco in Italy and the USSR. In 1942 he undertook to build a small single-seat experimental hybrid helicopter with a jet rotor (the vehicle was supposed to only take off and land as a helicopter, becoming an autogyro in cruise conditions). According to uncorroborated information, the work was done to a Kriegsmarine contract. The rotor of the WN 342 helicopter was propelled by a fuselage-mounted 60 hp (44 kW) Walter Mikron 4/II piston engine driving an Argus As 411 compressor. Compressed air was then led via ducts to the head of the 3-blade rotor, and along the blades to nozzles at their tips, where fuel was injected into the air stream and ignited.

The first attempts to hover the V1 prototype were made inside a hall at Wiener Neustadt in September 1943, with August Stephan as the pilot. The first free outdoor take offs, and hovering of up to 8 minutes at 1 to 3 metres, took place on 2 October 1943. After the airfield was bombed by the Allies and the V1 prototype was destroyed, further trials were moved to Ober Grafendorf, where in

WN 342, von Doblhoff's experimental helicopter of 1943. [R. Witkowski Archive]

1944 three more WNF 342 prototypes, the V2 and V3, and in 1945 the V4, were completed. The V2 was powered by a more powerful Walter Mikron 4-1 engine rated at 95 hp (70 kW), while the V3 and V4 used the 135 hp (99 kW) Argus As 8B. The V3 prototype was flown throughout its planned hybrid envelope, both as a helicopter during take-off and landing, and as an autogyro in cruise conditions. However, the machine was never put into production.

Another Austrian working for the Third Reich was Paul Baumgartl. He developed a helicopter that was built, but never qualified for production or use. He obtained an order to develop it in 1941. The idea was to design a 'back-pack helicopter' for use by individual soldiers. The first, engineless, prototype called *Helioflv* II-58 was built in 1941, and the second, called *Helioflv* III-57, powered by two two-stroke 8 hp (5.9 kW) Argus engines, was built a year later. Both prototypes were fitted with contra-rotating 4.76 m diameter rotors. The helicopter weighed 20 kg. Information about flight trials of the *Helioflv* III-57 prototype is lacking. It is certain, though, that the *Helioflv* III-59 prototype reached the flight test stage, although it was no longer a 'back-pack helicopter' as it was fitted with skids and an altered lifting system. The machine had two single-blade contra-rotating rotors (6.10 m diameter), of which the lower one used the engine as the counterweight.

N.R. Series

Apart from Baumgartl, Nagler and Rolz also worked on a miniature single-man helicopter. They built the first prototype of the NR 55 folding 'back pack helicopter' in 1940 and tested it indoors (without free flight testing). A year later they developed it into the NR 54 V1 flying machine, with a single-blade 7.92 m rotor, driven by a two-stroke 24 hp (17.6 kW) Argus engine. That same year the designers built a twin-engined variant of the helicopter, the NR 54 V2, with two two-stroke 8 hp (5.9 kW) Argus engines, four examples of which were subjected to ground and flight tests. The NR 54 was not accepted for production. The NR 53-I and NR 53-II helicopters developed by Bruno Nagler, with enclosed cockpit and with undercarriage, remained at the project stage.

Uncompleted rotorcraft projects were prepared during the war by three major designers and their teams, Henrich Focke, Anton Flettner and Ernst Heinkel.

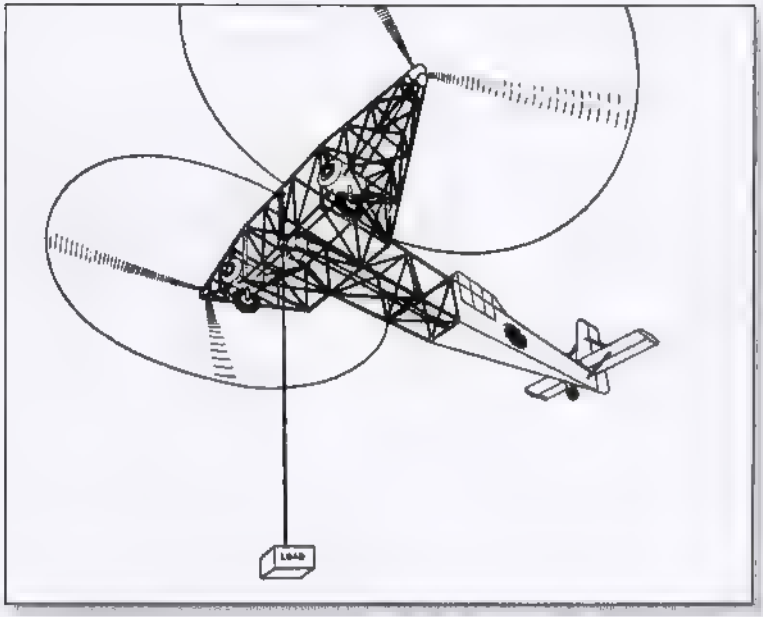
Fa 225

Focke's design that never reached beyond the flying prototype stage was the Fa 225 gyroglider. Originally this design was supposed to expand the equipment range of German airborne forces that used either parachutes or DFS 230 assault gliders. The latter were used, among others, during the attacks on Eben-Emael in 1940 and on Crete in 1941.

The idea for the Fa 225 emerged from experience with conventional DFS 230 gliders, as their landing run of several dozen meters causing some losses during operations. It seemed that these could be avoided if the wings of the DFS 230 were replaced by a rotor, thus allowing it to land by autorotation with only a short run.

At the end of 1942 the prototype was built, which used a DFS 230 fuselage, fitted with wheeled undercarriage with long stroke shock-absorbers, with the wings replaced by a slightly modified rotor from the Fa 223 *Drache*. Flight tests were completed during spring 1943 at Ainring, where the prototype was towed behind a Ju 52/3m. Paul Stammler was the test pilot during the trials. The landing run did not exceed 18 m. The Fa 225 gyroglider was not approved for production and use, as it was assumed that the reduced towing and approach speeds with respect to an orthodox glider (exposing the machine to enemy fire for a longer period) were a shortcoming that did not compensate for the shorter landing. The decision was probably also affected by the fact that after the heavy losses suffered by the German airborne forces in 1941 on Crete, the Germans virtually abandoned airborne landings. The last operation of the type was carried out by German airborne forces on 12 September 1943, to free the Italian fascist leader, Benito Mussolini, who had been interned since July 1943 in a hotel at the peak of Gran Sasso in the Appennines. A group of paratroopers landed on the peak plateau in standard DFS 230 gliders, although apparently it was originally planned to use the rotorcraft version.

Fa 225 gyroglider
[R. Witkowski Archive]



Project of the Fa 284 flying crane developed during 1941-1945 by Henrich Focke in co-operation with the French Bréguet factory [R. Witkowski Archive]

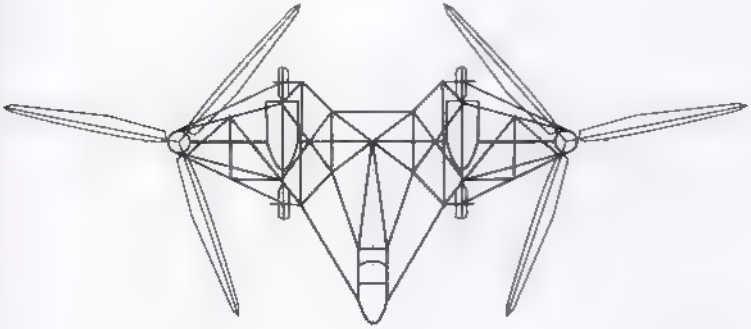
Fa 284

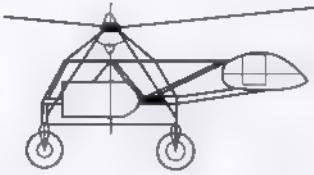
In 1941, in close co-operation with designers of the French Bréguet company from Toulouse, Henrich Focke developed the Fa 284 'flying crane', able to lift loads up to 4,500 kg. It was planned to employ the standard Focke helicopter layout with twin 17.83 m rotors mounted laterally. The fuselage structure was going to be an open spaceframe, with a cockpit for two pilots providing good visibility over the external load. Calculated empty weight of the helicopter was 8,100 kg, maximum weight with the crew, load and fuel was 13,500 kg.

The Fa 284 was going to be powered by two 2,000 hp (1,470 kW) BMW 821 A engines in pods on the spaceframe. The pilot was going to be seated in an enclosed cockpit in the tail section, which gave him an excellent view over the external load. Construction of the machine continued very slowly, the prototype was almost complete in 1945, but it was never finished and no tests were undertaken.

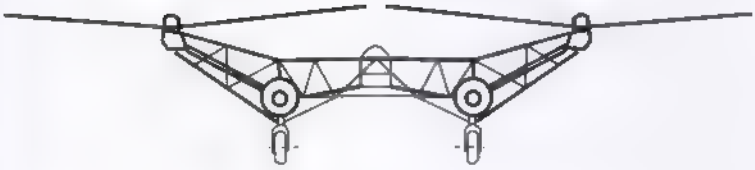
Fa 325 Krabbe

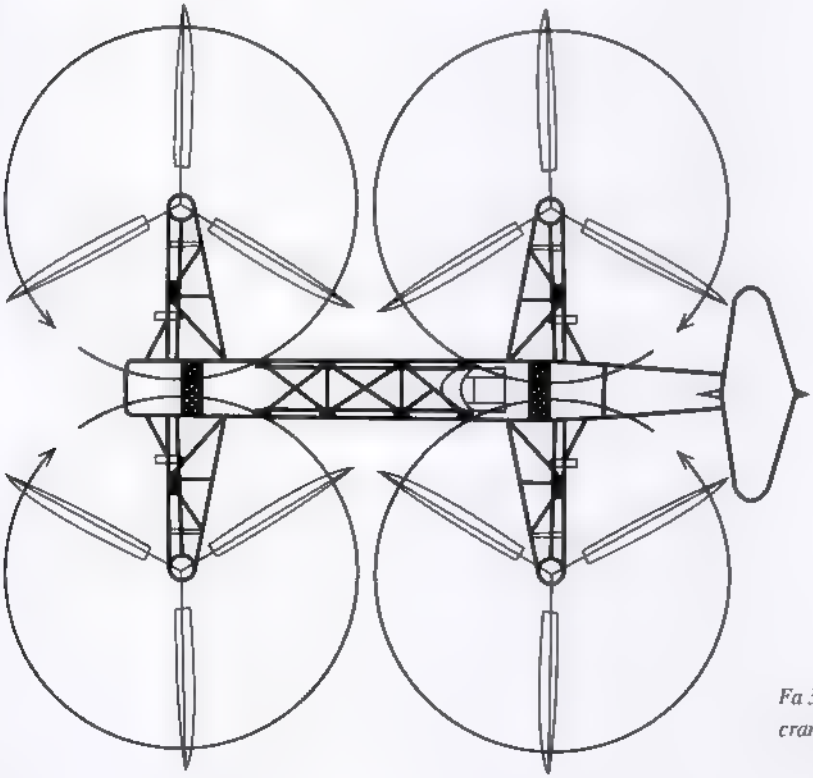
The Fa 325 *Krabbe* (Crab) was another helicopter-crane. Focke commenced work on it in 1943, and the Kriegsmarine was interested in the design, considering it for the torpedo-carrying role. This was going to be a four-rotor machine, resembling a doubled Fa 223 *Drache*. It would be powered by two 1,000 hp (735 kW) BMW 301 R-3 (Bramo 323 Fafnir) engines. Empty weight was calculated at 9,250 kg, and maximum take-off weight at 12,268 kg. Eventually, in 1943 the Kriegsmarine HQ withdrew their support and the Fa 325 *Krabbe* remained a paper project.





Alternative concept of the Fa 284 crane helicopter. [Hubschrauberzentrum Bückeburg]





Fa 325 Krabbe heavy flying crane project of 1943 [R. Witkowski Archive]

operate as pusher units. Calculated horizontal speed of the Fa 269 was expected to be 600 km/h. The project was not approved and no prototype was built.

Fa 283 Kampfhubschrauber

The Fa 283 *Kampfhubschrauber* project of 1942 was also never built. Very little is known about this project. Apparently, it was going to be an armoured attack helicopter, with a single lifting rotor and retractable undercarriage, powered by a 1,800 hp (1,323 kW) BMW 801D radial. The reactive torque from the rotor was to be countered by a system of two tail rotors in a 'V' arrangement, or by blowing engine exhaust gases sideways.

Paper Projects

'Paper projects' were also developed during the war by the team of Anton Flettner. In 1944 he obtained a contract to develop a two-seat observation helicopter for the army designated the Fl 339, as mentioned in Chapter 2. The machine would have a similar lifting system to the Fl 282 Kolibri, with two 2-blade intermeshing rotors, but with increased rotor diameter (13.2 m). The take-off weight was 1,300 kg, and a more powerful engine, the 240 hp (176 kW) Argus As 10C, was to be located above the spaceframe cockpit, which would be covered with *plexiglass* panels. The helicopter would have tricycle undercarriage and tail surfaces on a spaceframe boom. The Fl 339 helicopter, one of the last wartime designs of Anton Flettner, had also a civil variant. It was, however, too late to proceed with it, and not even a prototype was built.

The 'tailsitter' rotorcraft idea, proposed by Focke in the form of the Fw 354 *Triebflügel*, was also studied by the design team of Ernst Heinkel. In late 1944/early 1945 they developed a project for a VTOL fighter designated He 355A Lerche (Lark), which would have a lift-generating system in form of a coleopter with a system of rotors fitted inside, enabling vertical take-off. The machine would be powered by two 1,475 hp (1,085 kW) Daimler-Benz DB 605D piston engines, had a calculated top speed of 760 km/h. The project remained on paper, as did an advanced variant called the He 355B, powered by Daimler-Benz DB 109-021A turbine engines.

Another German helicopter project that failed to progress during wartime was developed by the well-known company AEG. It was a pilotless tethered observation helicopter. It made some flights in 1940, but failed to arouse interest.

The least advanced stage of all WW2 German rotorcraft projects was that of a tandem design with twin 7 m rotors, studied during late 1939/early 1940 as a general idea by the Henschel team. Their design office employed, among others, A. Riedl, the owner of patent rights for this rotorcraft layout. The project, planned to be powered by a 160 hp (118 kW) Siemens-Bramo Sh 314A, failed to gain interest. The only surviving traces of the project are drafts of the layout and a set of preliminary calculations.

Echoes

Subsequent chapters in the history of the *Drache* were added by the Czechoslovak and French aircraft industries. The former took over two incomplete examples of the Fa 223 *Drache* in the Avia factory at Letňany, near Prague. They were completed and made airworthy with the new designation of VR-1 (*Vrtulník* is Czech for *helicopter*) in May 1948. They were flown by the first Czechoslovak helicopter pilot František Janča, trained in Sweden using the Bell 47 of the H. Osterman AB company in Stockholm,. One of the VR-1 helicopters flew in police service, the other was used as a flying laboratory by the *Vyzkumný Zkušební Letecký Ustav* (VZLÚ, the aircraft research and development establishment). However, both helicopters suffered power plant failures in 1949, the police one during a flight from Prague to České Budějovice, and the VZLÚ one during an air display at Hradec Králové. Although both were repaired, they

VR-1 the Czechoslovak version of the Fa 223 Drache (1948).
[R. Witkowski Archive (top)]
[J. Fernandez (bottom)]

VR-1, the Czechoslovak version of the Fa 223 Drache (1948)

[R. Witkowski Archive]

VR-1, the Czechoslovak version of the Fa 223 Drache (1948)

[J. Fernandez]

This spread: *Official demonstration of the VR-1 helicopter, the Czechoslovak version of the Fa 223 Drache to authorities in 1948.*

[J. Fernandez]


OK-BZX

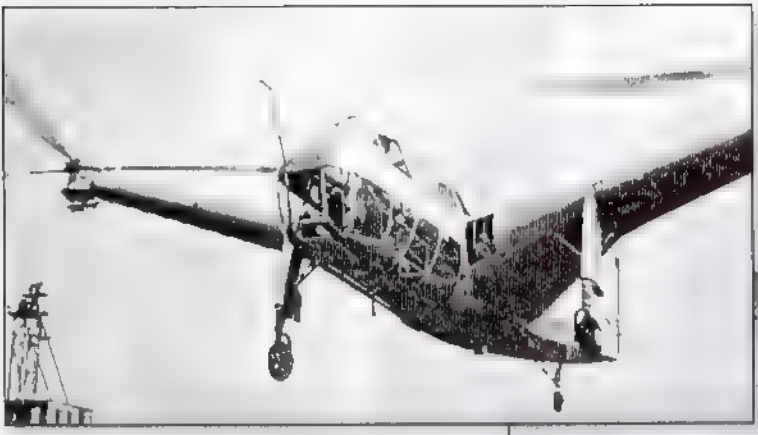
The French NC 2001 experimental helicopter (1948)
[R. Witkowski Archive]

The SE 3000, the French version of the Fa 223 Drache (1948)
[R. Witkowski Archive]

The Soviet Omega I helicopter designed by Ivan Bratukhin (1942)
[R. Witkowski Archive]

SE 3000, the French version of the Fa 223, Drache during factory tests (1948)

[J. Fernandez]



The American Platt Le Page XV-1 helicopter of 1941
[R. Witkowski Archive]

The French SO 1221 Djinn helicopter (1953)
[R. Witkowski Archive]

The American XV-1 helicopter (1954).
[R. Witkowski Archive]

The Soviet Mi 12 of 1967 the biggest helicopter in the world built in the lay-out of the historical Fw 61
[R. Witkowski Archive]

Kaman HH-43B Huskie rescue helicopter
[R. Witkowski Archive]

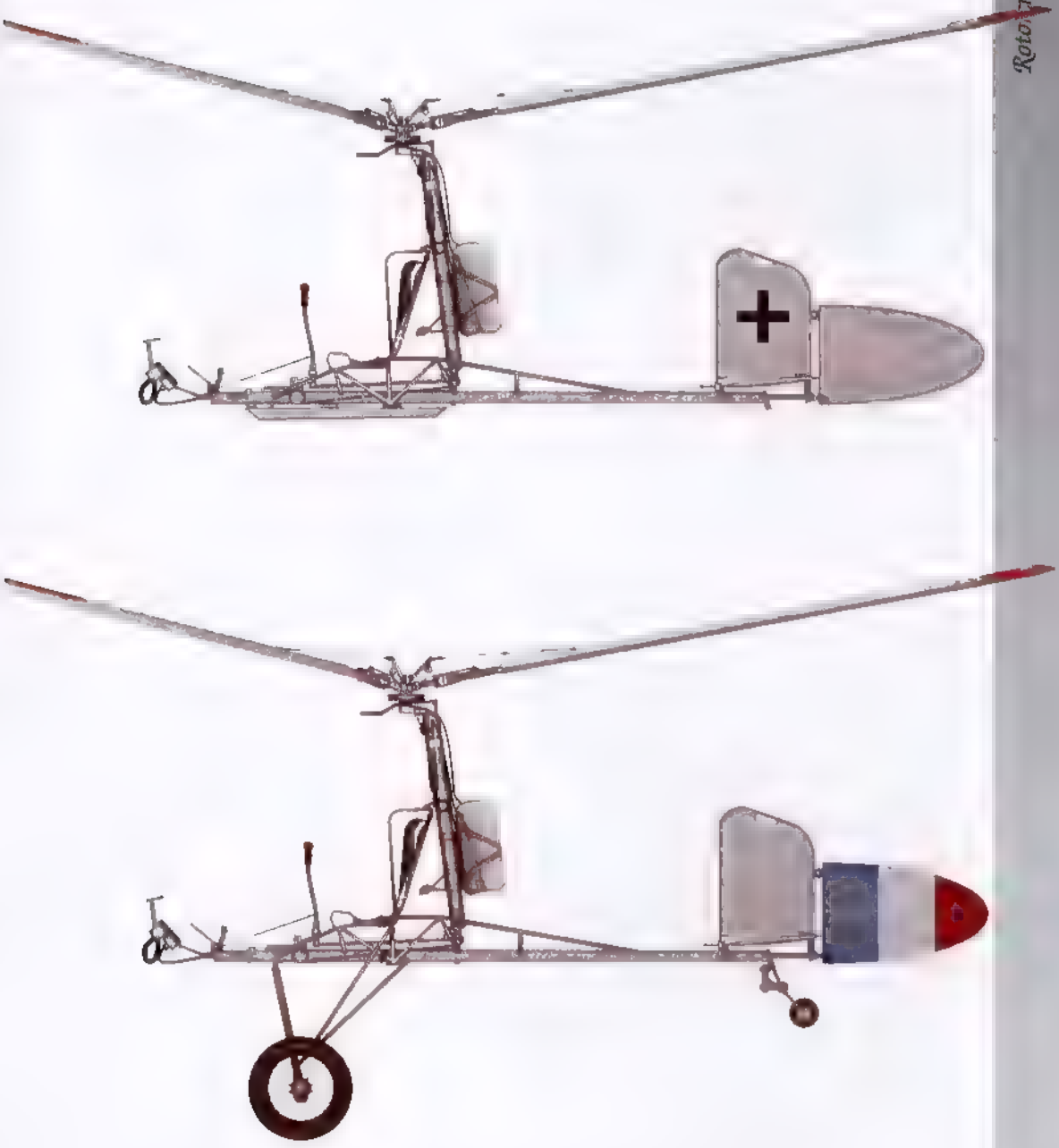
Another echo of German wartime work on rotorcraft design could clearly be seen in development of direct rotor propulsion helicopters a few years after WW2, following the experiments of baron Friedrich von Doblhoff. The subject was studied particularly seriously by the French. During 1947-1949 the state concern SNCASO (*Societe Nationale de Constructions Aéronautiques du Sud-Ouest*), with assistance of a German expert, Dr Theodor Laufer, a former co-worker of von Doblhoff, developed two helicopters, the SO 110 *Giravion* and SO 1100 *Ariel I*, which used jet powered rotors. These were experimental machines. In 1953 the SO-1221 *Djinn* helicopter entered series production. In this design, however, there was no fuel injection into the compressed air, the latter blowing out of the nozzles at the blade tips, the so-called 'cold jet'. In Britain, on the other hand, the Fairey *Gyrodyne* of 1948 and Fairey *Rotodyne* of 1957 employed von Doblhoff's idea in full ('hot jet'). Baron Friedrich von Doblhoff himself continued his work in the USA as the chief engineer of McDonnell, where in 1954 the XV-1 experimental helicopter with a 3-blade rotor was built.

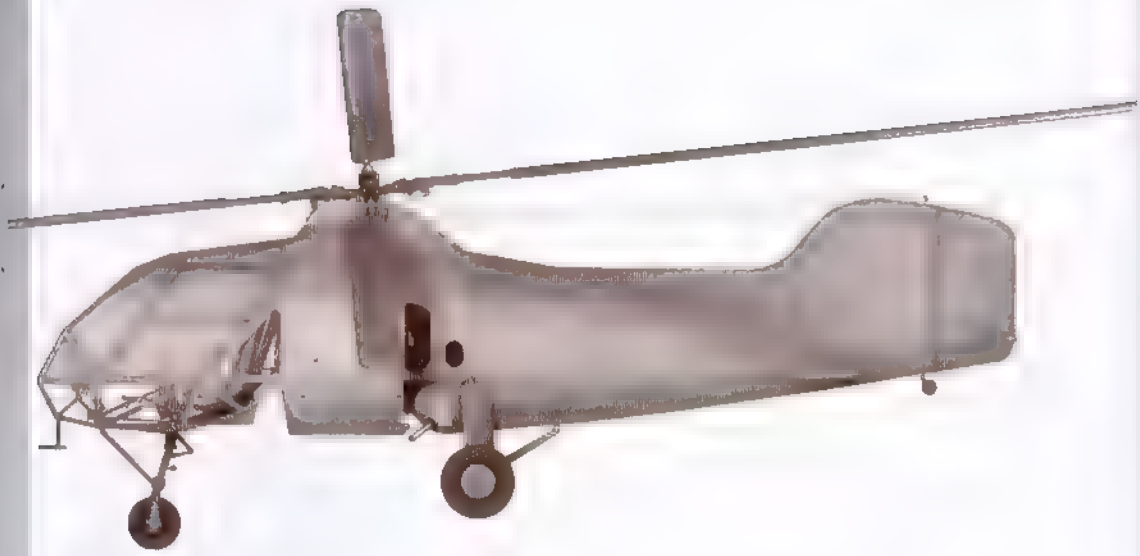
The French SO 1100 Ariel I experimental jet rotor helicopter
[R. Witkowski Archive]

Above: *Cierva C 30 'D-EKOP', 1935 Silber 01, (silver) overall*
Below: *Flettner Fl 256 V1, Berlin-Schönefeld, 1939. Silber 01, (silver) overall.*

Above. *Flettner Fl 265 V3, 'TK+AN' 1940, Creme 05 (Cream) overall with German markings*
Below *Flettner Fl 265 V5, 'GI+SB' Berlin-Johannisthal, 1941 Creme 05 (Cream) overall with German markings*

***Top**: Focke Achgelis Fa 330 A-1, 1942. Silver overall with German markings.*
***Bottom**: Focke Achgelis Fa 330 A-1, 1945, in French markings.*





Above *Fl 282 V2, 1942. Silver overall*
Below *Fl 282 V3, 1942. RLM 71 Dunkelgrün uppersurfaces and RLM 65 Hellblau undersides*

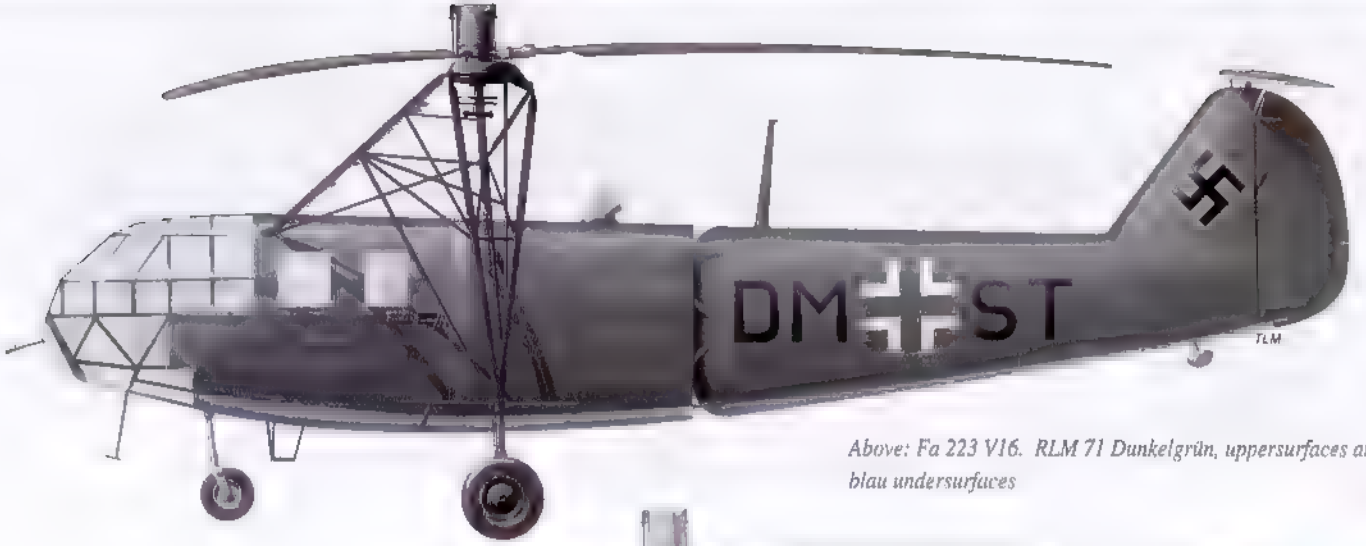
***Above**: Fl 282 V12 CJ+SF, spring 1943. Grey overall.*
***Below**: The same machine as above repainted in RLM 71 Dunkelgrün uppersurfaces and RLM 65 Hellblau undersides*

Above: *Fl 282 V21, the first B-2 series machine*
Below: *Fl 282, probably V52 with Soviet markings. German camouflage RLM 71 Dunkelgrun upper-surfaces and RLM 65 Hellblau undersides. German markings overpainted in green*

Above *Fl 282 V23 with American code "FE-4613", September 1945, Freeman Field*
Below: *WNF 342 V4 as seen after the war*

Above: *Fa 223 V1, D-OCEB, Rechlin, October 1940. Silver overall.*
Below: *Fa 223 V2. D-OCEW, 1940. Silver overall.*

Above. Fa 223 V14. DM+SR, during trials in 1944. RLM 71 Dunkelgrun upper surfaces and RLM 65 Hellblau undersurfaces.
Below. Fa 223 V13. DM+SP. 1943. Silver overall.



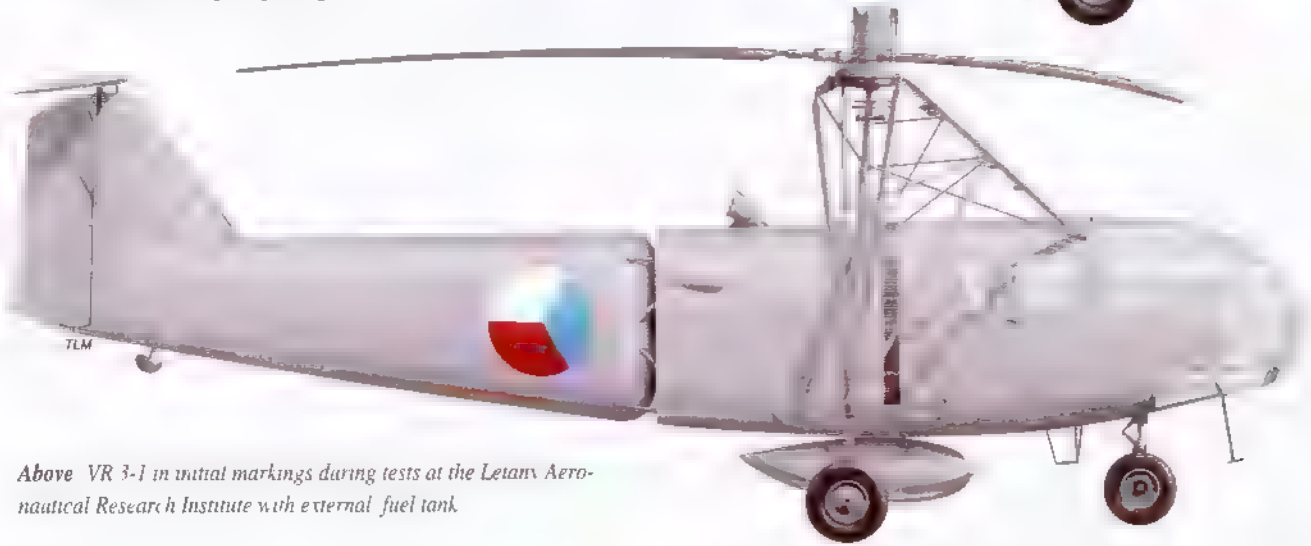
Above: Fa 223 V16. RLM 71 Dunkelgrün, uppersurfaces and RLM 65 Hell-blau undersurfaces

Above *Fa 223 V2 D-OGAW 1942 Silver overall*

Above: *FA 223 V51, GW+PA, 1945. This helicopter was the first production machine off the Weser production line at Berlin Tempelhof. RLM 71 Dunkelgrün, uppersurfaces and RLM 65 Hellblau undersurfaces.*

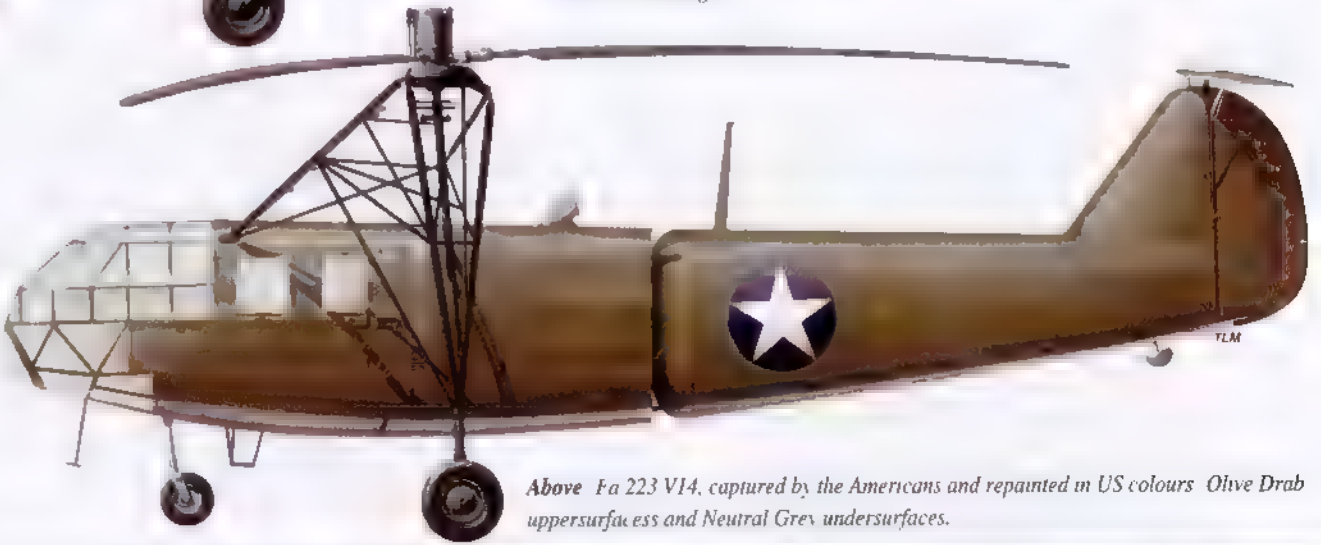
Above *Fa 223 V11, DM+SO, 1943. Silver overall*

Above *VR 3-1, OK-BZX, used by the Czechoslovak Air Police, 1946. Silver overall with red front fuselage*



Above *VR 3-1 in initial markings during tests at the Letany Aeronautical Research Institute with external fuel tank*

Above *Fa 223 V14, at AFEE Beaulieu, 1945. Uppersurfaces repainted Dark Green with RAF markings*



Above *Fa 223 V14, captured by the Americans and repainted in US colours. Olive Drab uppersurfaces and Neutral Grey undersurfaces.*

Survivors

Type	W.Nr.	Location
Fa 330	100032	Veteranmuseum, Egeskov, Denmark (ex RAE Farnborough)
Fa 330	100143	Imperial War Museum, Duxford, England
Fa 330	100406	Hubschrauber Museum, Buckeburg, Germany
Fa 330	100502	Real Aeroplane Museum, Breighton, England
Fa 330	100503	Royal Air Force Museum, Cosford, England
Fa 330	100509	Science Museum, Wroughton England
Fa 330	100545	Fleet Air Arm Museum, Yeovilton, England
Fa 330	100549	Lashenden Air Warfare Museum, Headcorn, England
Fa 330		Musee de l'Air et de l'Espace, Paris, France
Fa 330	100150	Musee de l'Air et de l'Espace, Paris, France (incomplete)
Fa 330	100345	Deutches Technikmuseum, Berlin, Germany
Fa 330		Deutsches Museum, Munich, Germany
Fa 330	60133	National Air and Space Museum, Washington D.C , USA, (ex T2/FE-4618) Previously on loan to Pima Air and Space Museum in Tucson, Arizona.
Fa 330		Wright Patterson AFB, Dayton, Ohio, USA (ex T2/FE-4617)
F. 282 V20	2820000020	Midland Air Museum, Coventry Airport, England (ex Cranfield)
NR 54 V2		Hubschrauber Museum, Buckeburg, Germany

List of survivors based at the list published at http://www preservedaxisaircraft.com by Mikael Olrog

Fa 330 W.Nr. 100503 at Royal Air Force Museum, Cosford.
Stratus coll

Left, Front view of the Fa 330, Cosford
Stratus coll

Above: Instrument panel of the Fa 330
Stratus coll

***Below** Two photos of Fa 330 at Cosford Stratus coll*

Details of the Fa 330 rotor head

Stratus coll

Two photos of Fa 330 tail, Cosford.

Stratus coll.

This page· *Photos of Fa 330 W Nr 100503, Cosford, UK*

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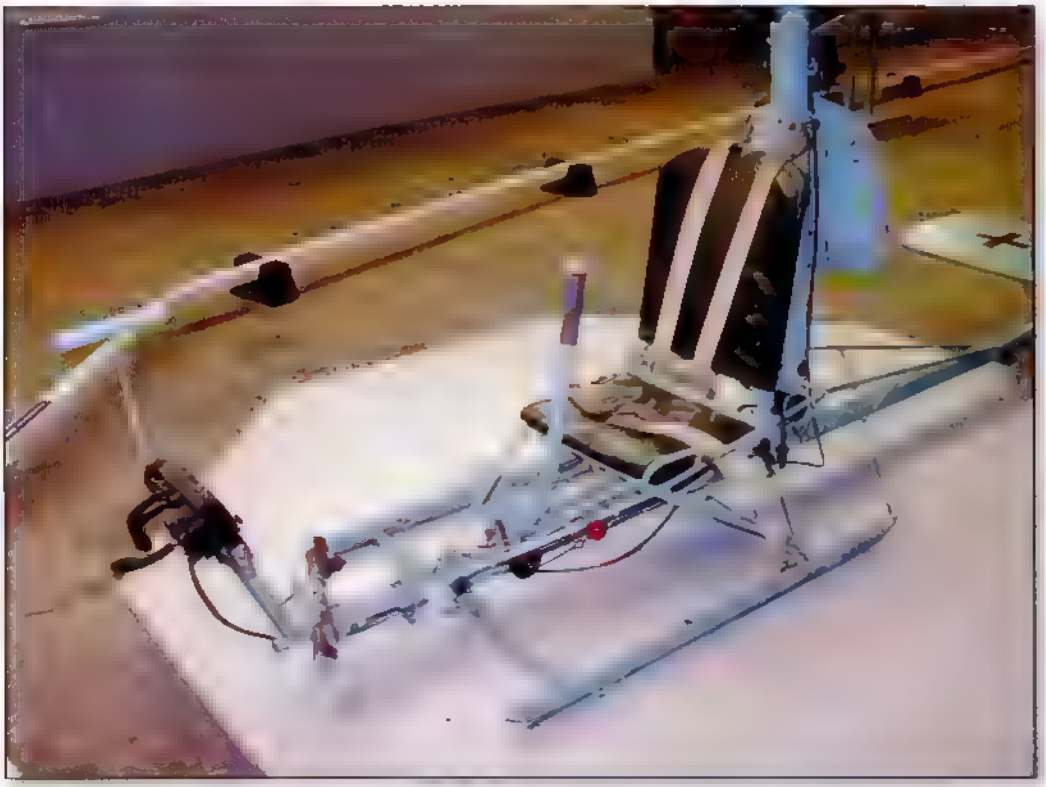

Close-up shot of Fa 330 rotor head.

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***Right**. Fa 330 at Cosford, 2002*

***Below**: Port side view of the Fa 330 at Cosford, 2006.*

Both photos Stratus coll

This page: *Fa 330 W.Nr unknown, ex T2-4617 preserved at USAFM, Wright Patterson AFB, Dayton, Ohio, USA.*

M. Olrog (2), USAFM (1)

Fa 330, W. Nr unknown at Deutsches Museum, Munich, Germany

M. Olrog

Fa 330, W Nr 100406 at Hubschrauber Museum, Buckeburg, Germany

M. Olrog

Fa 330, W Nr 60133, (ex T2/FE-4618) at Pima Air and Space Museum in Tucson, Arizona, USA Now National Air and Space Museum, Washington D.C., USA

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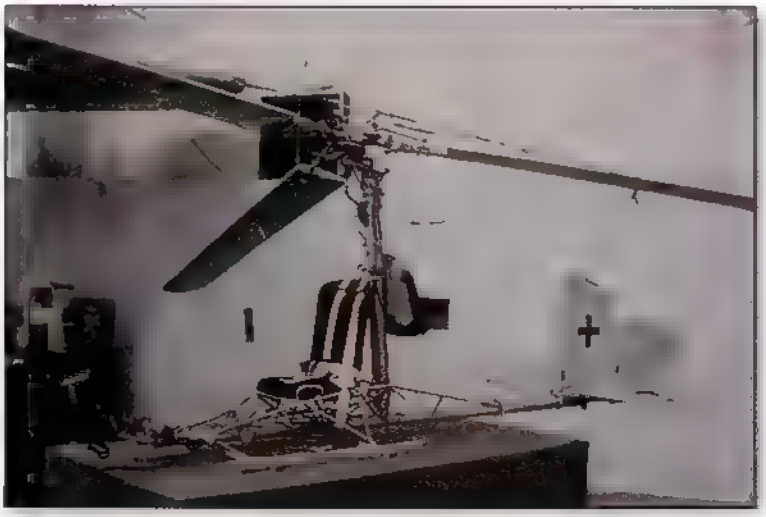
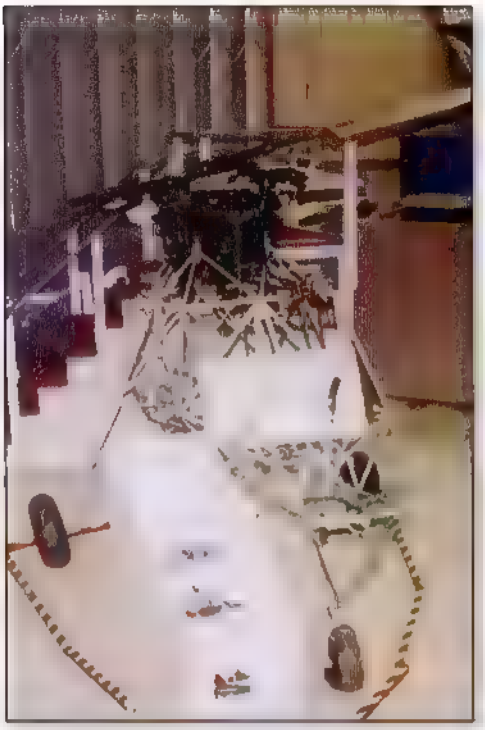
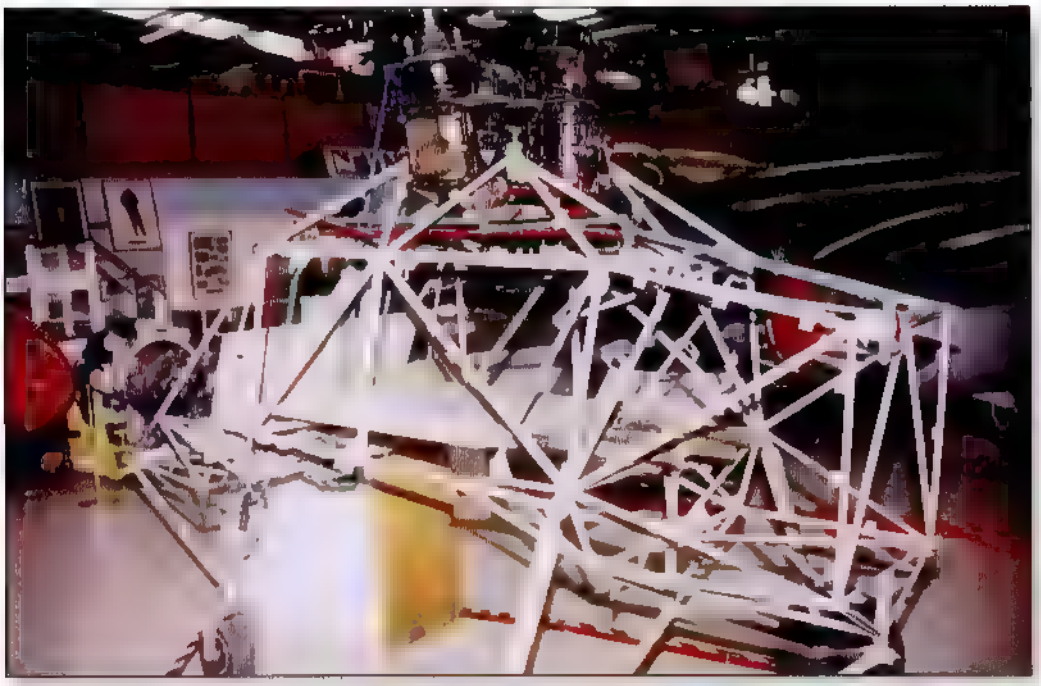
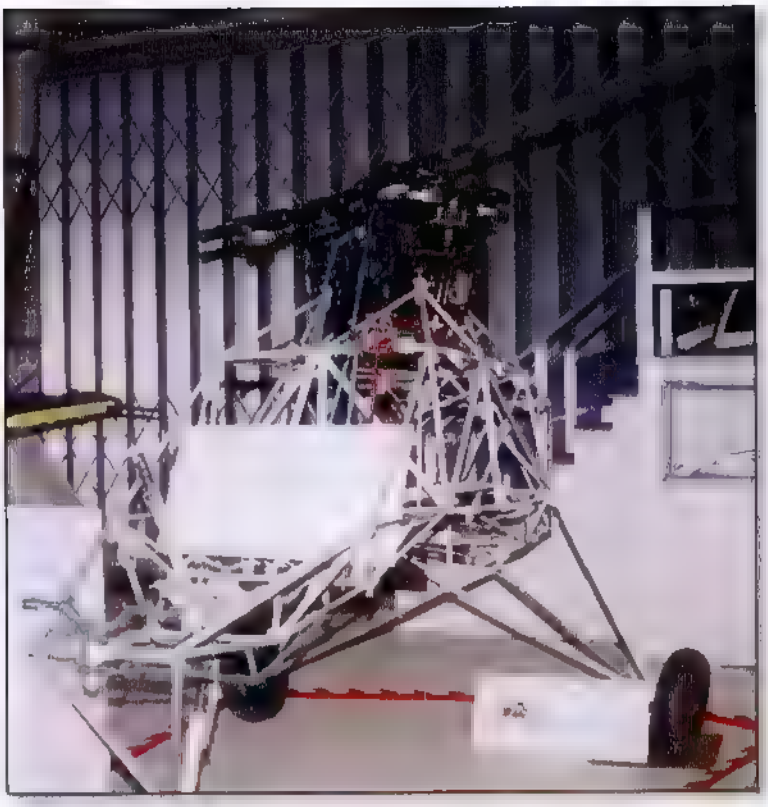




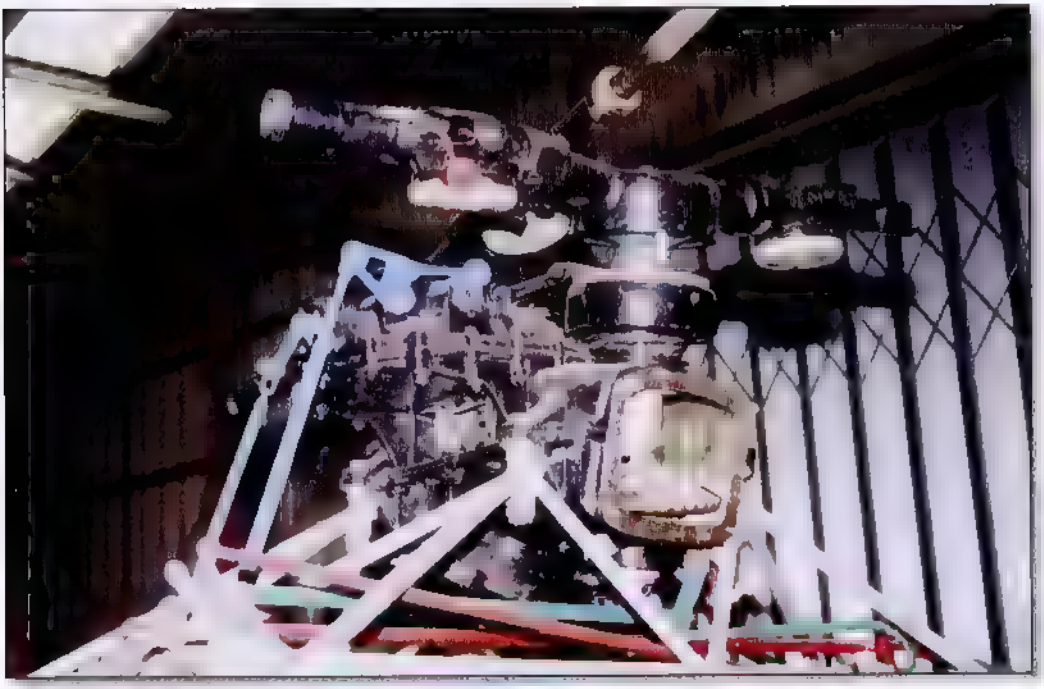
This page: *Fuselage structure of Fl 282 V20 at Midland Air Museum Coventry, Uk*
M Olvog



Front view of the Fl 282 at Midland Air Museum
M. Olrog



Details of Fl 282 rotor heads at Midland Air Museum
M. Olrog



The Fa 223 V14 at Nellingen-Stuttgart in US markings.
via J. Fernandez

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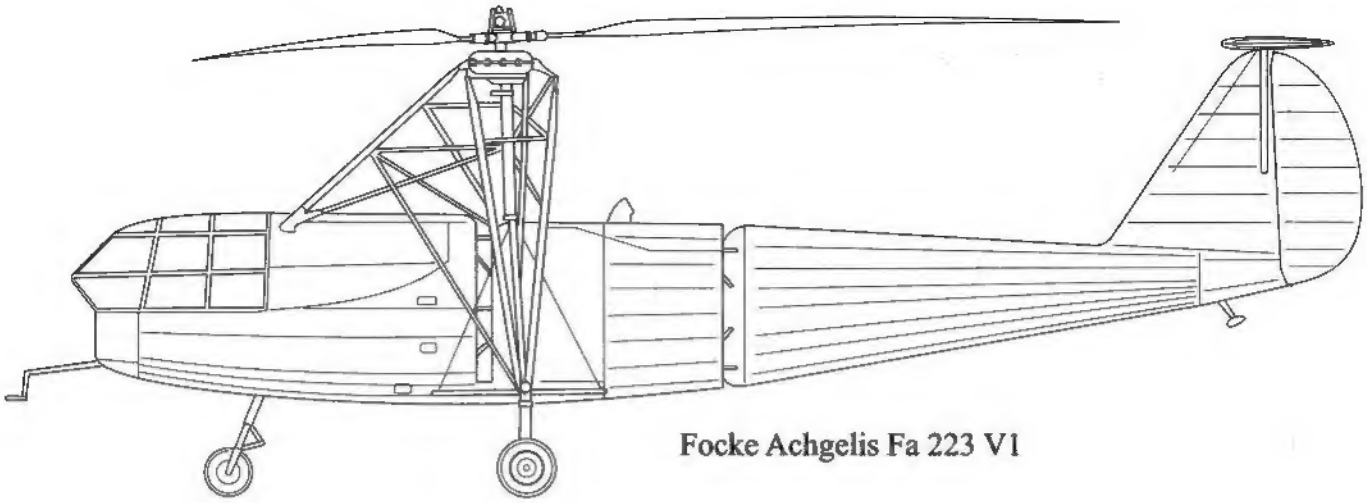
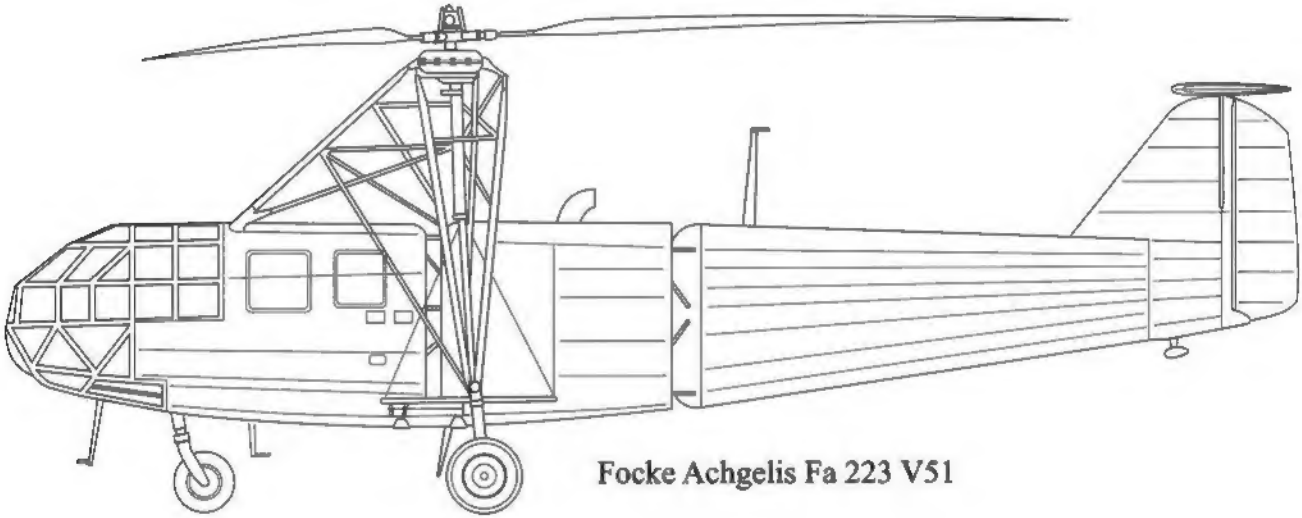
Preserved Axis Aircraft webpage:
http://www.preservedaxisaircraft.com/,
by Mikael Olrog

Fl 282 V15 with US code FE-4614 in 1945.

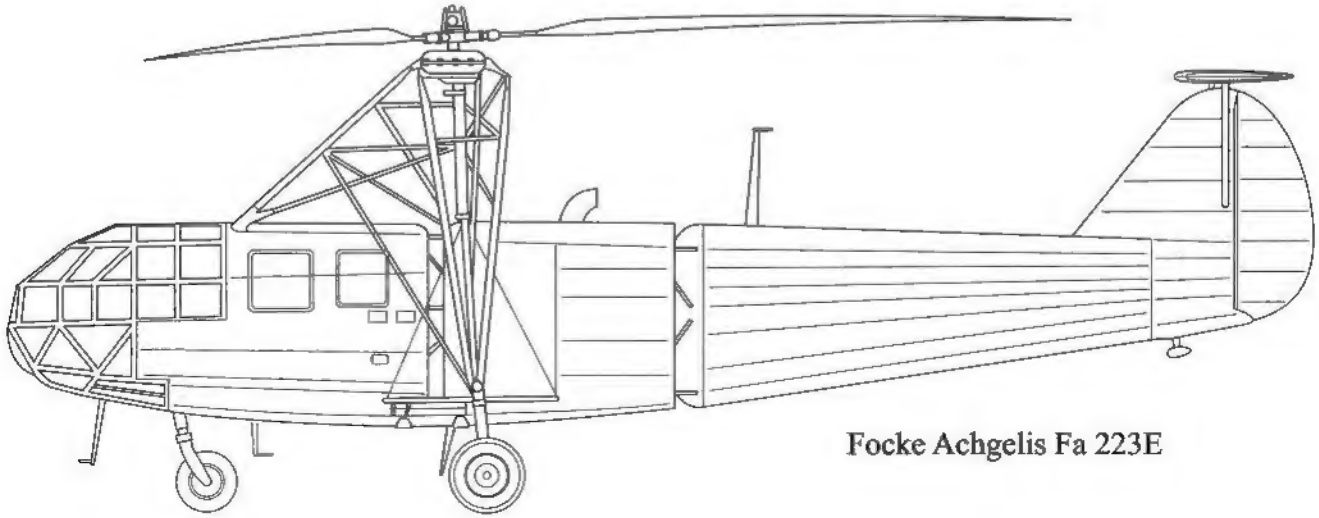
Stratus coll.



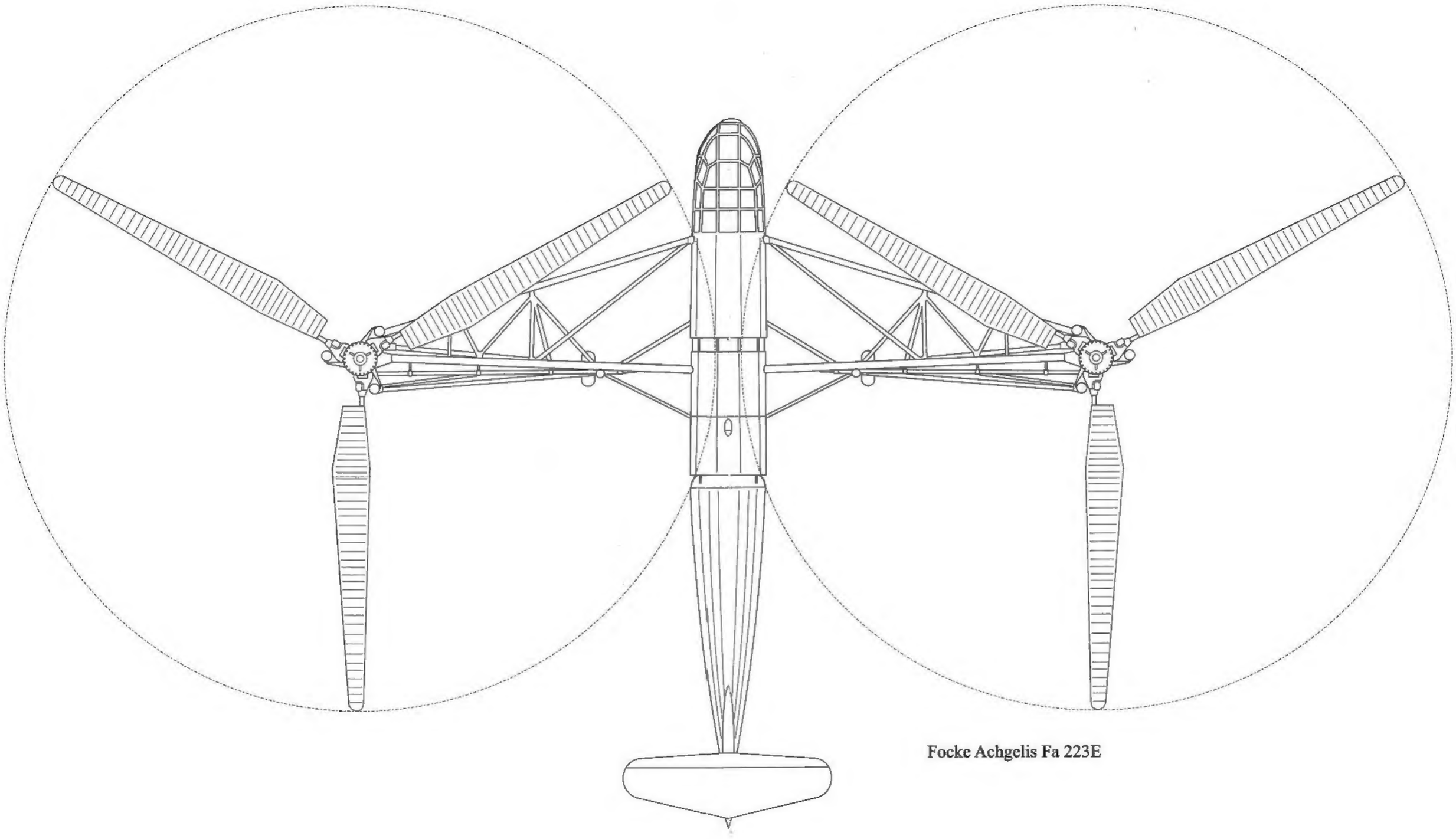
Focke Achgelis Fa 223 V1



Focke Achgelis Fa 223 V51



Focke Achgelis Fa 223E



Focke Achgelis Fa 223E